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MOTT

MOTT'S PLUMBING FIXTURES



HEATERS FOR
WATER SUPPLY



MODERN METHODS OF HEATING WATER



THE J. L. MOTT IRON WORKS

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Introduction

RECOGNIZING the importance and need of an adequate and efficient apparatus for supplying hot water, we have designed a line of heaters to meet all requirements. These are economic in operation and of unequalled durability.

On the following pages we illustrate and describe our Tobey, Efficient, Security and Economic Steam Heaters for Water Supply and the Sunray Tank and Iron Heaters, a most complete line of direct water heaters.

Careful consideration of the means for water supply is essential and we therefore devote considerable space to information useful to the architect and engineer though we do not claim to have covered the subject. Special requirements and peculiar conditions must necessarily be carefully considered and we invite correspondence that we may be enabled to offer our suggestions and to assist where possible.

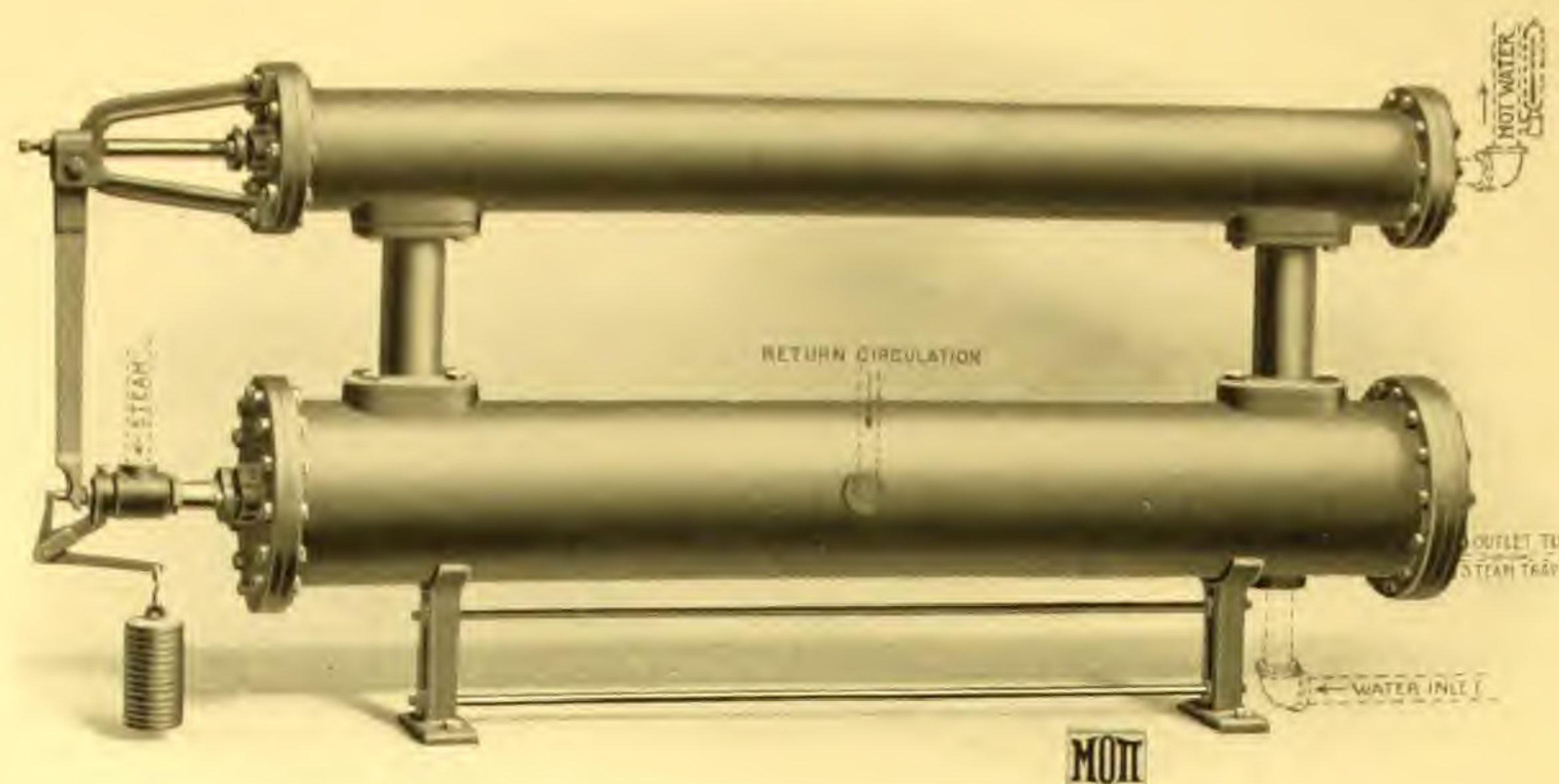


Plate 8040-A. No. 1½ "Tobey" Heater.

Plate 8040A and 8041A—The Tobey Automatic Water Heaters

Number	Length Over All	Height	Space Required to Remove Tubes	Diameter of Lower Shell Flange in Inches	Diameter of Upper Shell Flange in Inches	Length of Shell	Cold Water Inlet and Return Circulation in Inches	Hot Water Outlet in Inches	Size of drip in Inches	Capacity in Gallons per Hour from 50° to 150° with 40 pounds Steam	Suitable Size Steam Trap	Price with Valve for 40 lbs. Pressure
1 a	7' 6"	3'	7'	10 ½	8 ½	6'	2	2	¾	1000	1 ½ Tobey	\$250
1 ½	7' 7"	3' 6"	7'	14	10 ¼	6'	2	2	¾	2000	2 "	350
2	8' 11"	4' 3"	8'	21 ½	13 ½	7' 4"	3	2 ½	1 ¼	3000	2 "	475
3	9' 11"	4' 3"	8' 6"	21 ½	13 ½	8' 4"	3	2 ½	1 ¼	5000	2 ½ "	600
4	10' 3"	4' 9"	9'	28 ½	13 ½	8' 4"	4	4	2	8000	6 Lawler	1150

Capacities and Pressures

Capacities with 10 lbs. steam are 25 per cent less than listed at 40 lbs. and with exhaust steam 50 per cent less.

For high pressure steam the valves furnished are: 1A, 1"; No. 1½, 1¼"; No. 2, 1½"; No. 3, 2" and No. 4, 2½". For low pressure the corresponding valves are 1½", 2", 2½", 3" and 4" for which the extra charges are as follows: \$2.50, \$5.00, \$8.00, \$10.00, \$15.00.

For exhaust steam, valves should be made 2", 2½", 3", 4 and 5", respectively, for which the extra charges are \$5.00, \$8.00, \$10.00, \$15.00 and \$20.00 over list given in table.

To get best results the pressure of steam on these heaters should not exceed 40 pounds. It should never go above 50 pounds.

When ordering a "Tobey" Heater always give the steam pressure and the number and kind of fixtures to be supplied with hot water, so that we may know whether the heater you have ordered is sufficiently large for your requirements. This is important as it is always expensive to correct errors of this kind.

Description and Operation

The "Tobey" Automatic Water Heater is composed of two horizontal cylinders. The upper cylinder contains a perforated copper tube through which all the outgoing water passes; the hot water expands this copper tube, which pushes a lever at the end of the heater thus gradually closing the steam valve until the desired temperature is reached when valve closes; a corresponding fall in temperature will immediately contract the copper tube, and so open the valve for a fresh supply of steam.

The lower cylinder contains copper tubes which receive the steam and transmit heat to the water. The tubes are connected into independent heads, one of which has an adjustable center connection to provide for expansion and contraction. One of the flange connections between the upper and lower cylinders is made solid, so that all the cold water entering the lower cylinder must pass along and around the steam tubes before it can escape to the upper cylinder.

The automatic valve consists of a lever which is acted on by the expansion tube, a balanced double-seated steam valve, and an adjusting device at the top of expansion lever. The adjustment of the temperature is governed by a set-screw, which may be set by lock nut thus preventing it from getting out of adjustment.

Setting-up and Adjustment

Plates Nos. 8040-A and 8041-A show the proper way of making connections to the "Tobey" Water Heater, the steam pipe to the steam valve, the waste pipe to the trap and the water connections to and from the heater. After these connections have been properly made try the heater with all valves opened (the steam valve not more than $\frac{1}{4}$ ") and during this trial run, watch the temperature of the hot water discharged and when it reaches a temperature a few degrees less than is required, close the steam valve by unscrewing the regulating screw. The steam supply will then be cut off automatically and the temperature of the water will fall allowing the copper tube in the upper cylinder to contract which will act on lever and again open the steam valve admitting steam to heat the water. Two or three trials may be necessary before the regulating screw is adjusted to hold the temperature of the water within the required limits. When this adjustment regulates the temperature satisfactorily lock the set screw with the nut provided.

Care must be taken to see that the amount of water discharged does not exceed the capacity of the heater. The discharge pipe is always a little larger than necessary, but the flow of water through the heater should be adjusted so that it will not be greater than the capacity of the heater to heat it. If the flow of water is not properly adjusted the desired temperature will not be maintained.

Steam Trap

The steam trap should be placed so that inlet is below the outlet from the heater and a by-pass should always be provided to take care of the discharge from heater whenever it is necessary to clean the trap. The discharge from the trap should be taken to a sewer or into a well or tank, which must be open to the atmosphere.

Selection of Position for Heater

The "Tobey" Heater can be suspended from the ceiling, held on wall brackets or rest on the cradle which we regularly furnish with each heater.

Particular attention should be paid to the position in which the heater is placed for the following reason: The tubes are drawn out of the heater from the return end, therefore, it should be placed so that at the return end there is space (see table on previous page) corresponding to the length over all, so that when it is necessary to clean the tubes they can be withdrawn without disturbing the water connections.

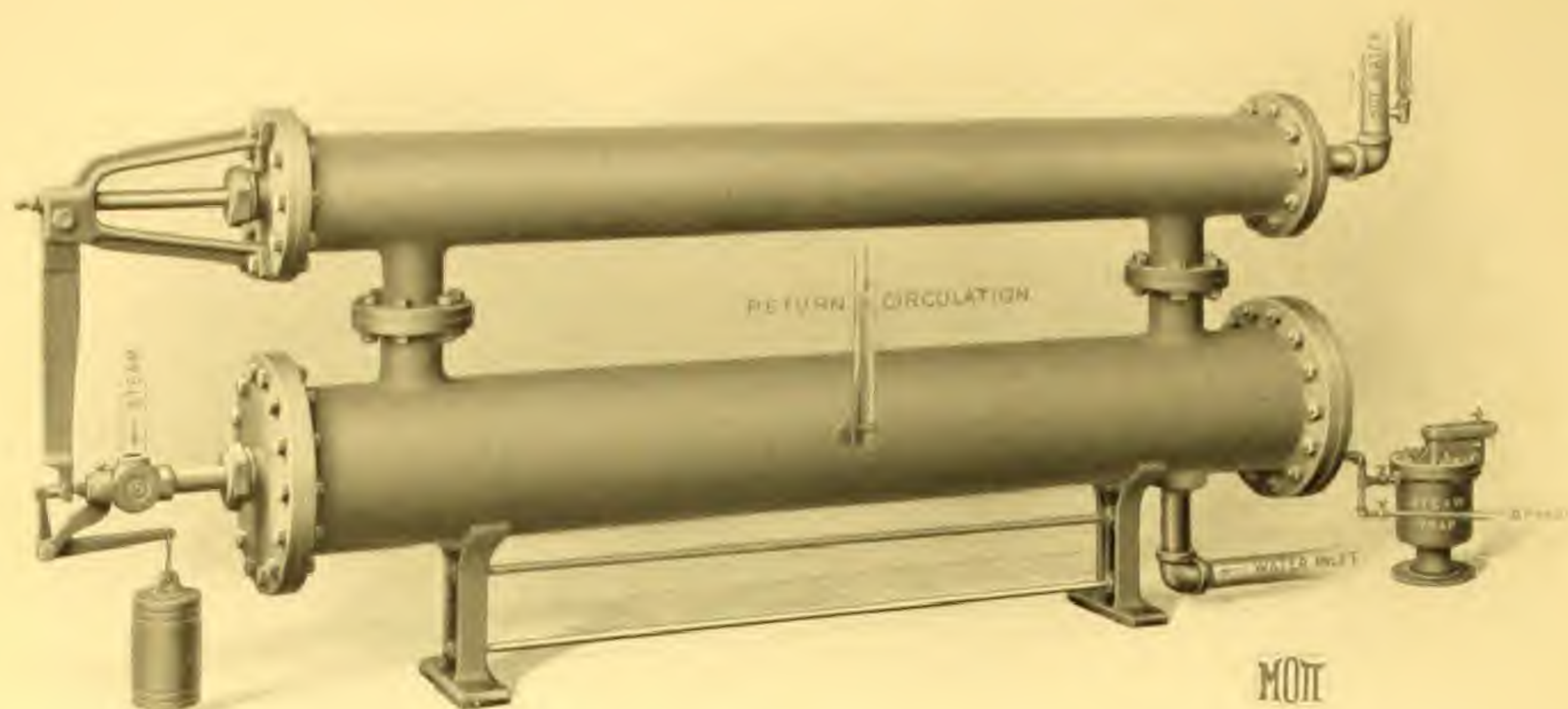


Plate 8041-A. No. 2 "Tobey" Heater.

Care of Heater

Any heater to give proper results has to be cleaned from time to time. This is especially true when the water carries lime or other substances that are precipitated by heat and form scale on tubing tending to reduce the efficiency of the heater.

One of the advantages of the "Tobey" Heater over any other type of Steam Water Heater is the fact that it can be so easily taken apart and cleaned.

Another important feature is that by its construction the water is caused to circulate outside of the tubes, and the solid matter therefore collects on the outside only, whereas in heaters in which the water passes through the tubes, the sediment is likely to clog them up and it is a tedious task to remove such sediment.

A Method of Cleaning

A simple method of cleaning a nest of tubes after removing them is to immerse them in a bath containing 10 per cent solution of hydrochloric acid. The cleaning trough can be made of wood.

After the tubes have remained in this solution for about five hours, they can be removed, thoroughly cleaned and rinsed clear of any of the solution before replacing in the heater.

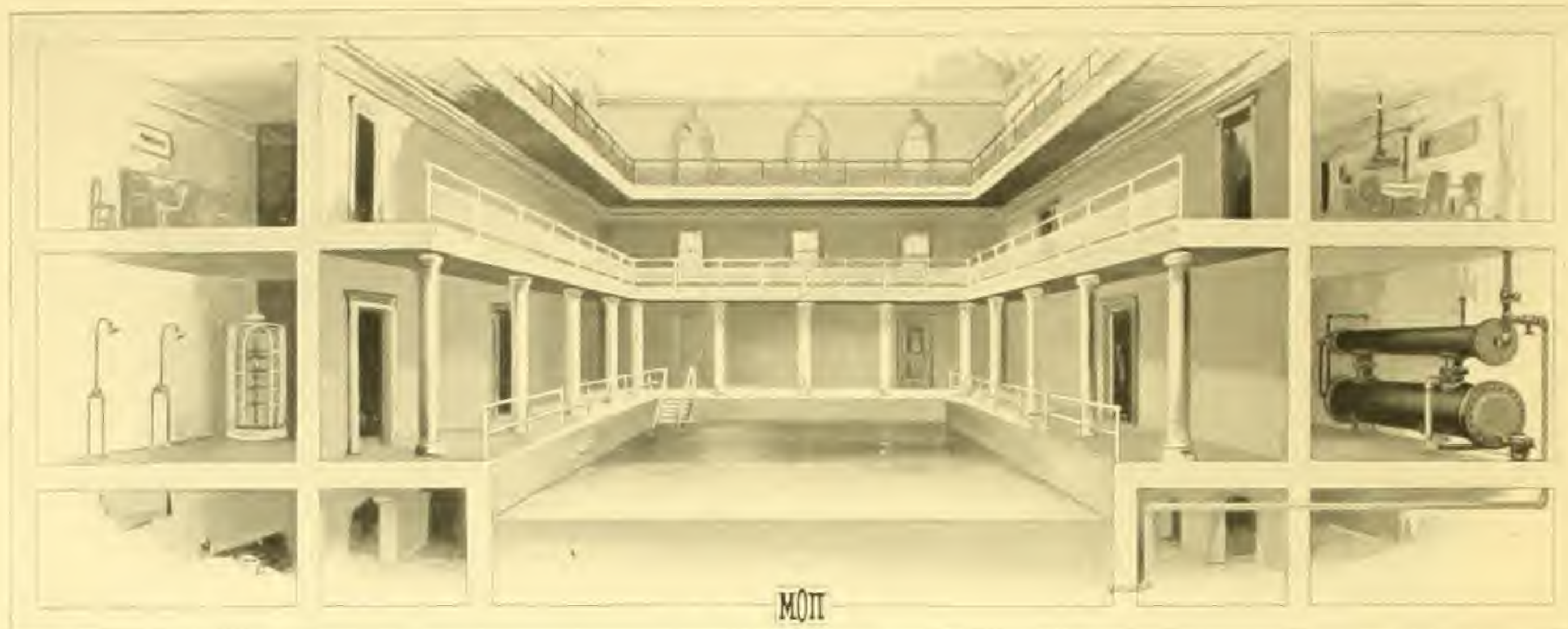


Plate 3145-A

Swimming Pool and Baths

The above cut illustrates the "Tobey" Heater installed in a bathing establishment where it is used to supply the hot water for the swimming pool, showers and lavatories.

In such an installation the "Tobey" Heater should be provided large enough to heat the water in the pool in as short a time as would ever be required. The heater would then be operated for heating the swimming pool during the night and at other times be used to supply hot water to various fixtures throughout the building.

It is always wise to install two "Tobey" Heaters so that if it is found at any time necessary to take the heater apart for cleaning, the supply of hot water would not be completely cut off, as would be the case if only one heater was installed.

A "Tobey" or "Efficient" Steam Trap should be used with every installation of the "Tobey" Heater.

Size Heater Required

It is customary to heat all the water as it flows into the pool, the size of heater required being determined by the size of pool, the length of time during which it must be filled and the steam pressure available.

Owing to the loss of temperature by the flowing water when filling pool, it is best to adjust the heater to deliver the water about 5° higher than required in pool. As much time as possible should be allowed for the operation—10 hours being the usual basis for figuring—a pool of 50,000 gallons capacity would therefore require a heater capable of supplying 5,000 gallons per hour, it is usually only necessary to raise the temperature from 30° or 40° to 80°, in which case, with 40 lbs. steam pressure a No. 1½ "Tobey" 2,000 gallons capacity would be the proper heater. If the work is to be done in 5 hours, two such heaters would be required.

It is not necessary to circulate the water in a pool through the heater as the loss of temperature during a week or 10 days would not be great enough to require it, thus the heater is available for supplying water for other fixtures when not in use for the pool.

Other Uses

As the "Tobey" Heater can be operated by exhaust, low pressure or high pressure steam, it will be found adaptable for use in any place where such a supply of steam can be obtained.

This heater is of great service in laundries, hospitals, hotels, restaurants, factories, office buildings, in fact, wherever large quantities of hot water are required either steadily or intermittently. It is an excellent heater for forced circulation, hot water heating systems in greenhouses or other buildings.

The "Tobey" Heater being compact and requiring no storage tank, can be used to advantage where little space is available for installation.

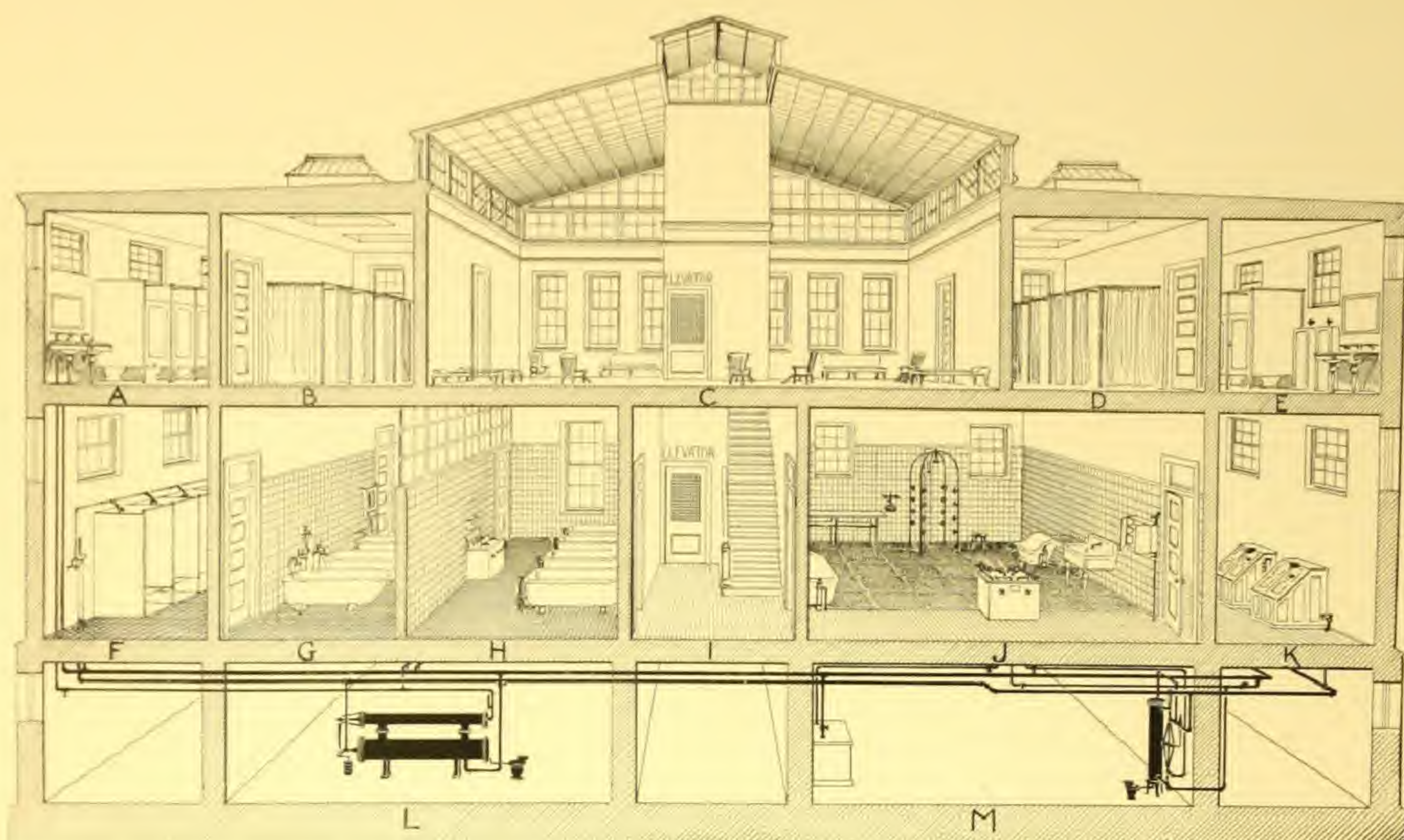


Plate 3150-A

Necessity of Temperature Control

Automatic regulation of the temperature of water wherever hot water is used is desirable and in some cases indispensable.

The inventor of the "Tobey" Heater was prompted to get up the first heater of this type after having witnessed some serious cases of scalding from water without temperature control.

The plate above represents a building equipped with our apparatus and fixtures for giving hydrotherapeutic treatment. In such an institution the proper control of the temperature of the water is essential and we suggest, wherever installations of this kind are under consideration, that we be consulted.

There are numerous reasons for the proper regulation of the temperature of water when being heated by steam. As high pressure steam is capable of changing water to steam, it is necessary to guard against such an occurrence. Water at a scalding temperature is dangerous when used for bathing and should be automatically regulated.

In some sections the composition of the water is such that when raised to a certain temperature and brought into contact with cast or wrought iron excessive corrosion takes place, discoloring the water. If this continues the plumbing fixtures become stained with rust.

The "Tobey" Heater is designed for overcoming such occurrences where caused by overheating, though in some instances galvanizing is necessary.

There is no more economical way of heating water than by means of the "Tobey" Heater, because when the water that is passing through the heater is raised to the temperature desired the steam supply is shut off and waste prevented. No steam is used except when water is being drawn or circulated through the piping. This feature alone is well worth consideration.

Efficient Heater

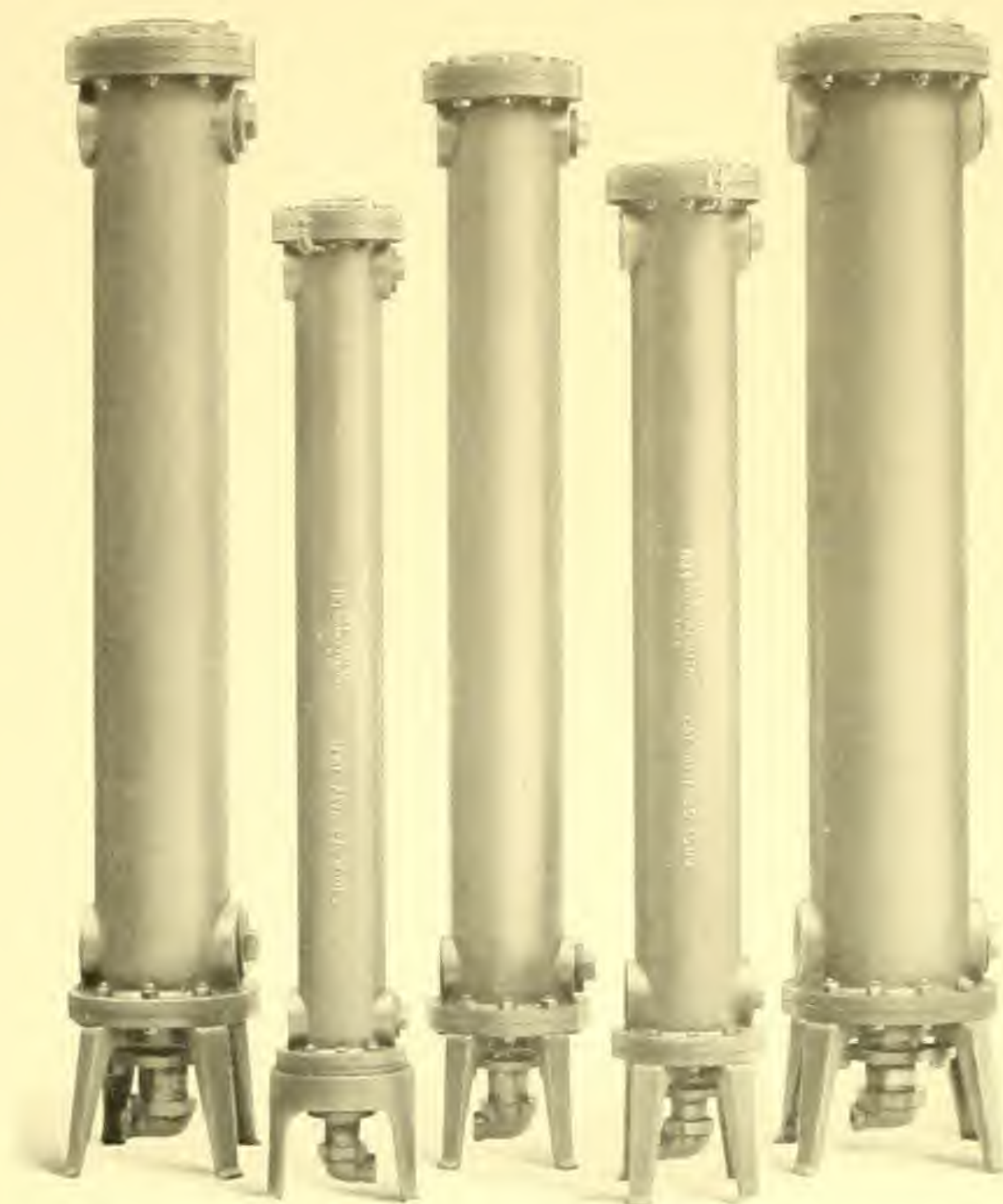


Plate 8043-A

The "Efficient" Heater, Plate 8043-A, makes possible the extensive use of a steam water heater because of its numerous sizes embracing those small enough for private house work and large enough either singly or in batteries for hotels, hospitals, etc.

Steam has been used for years to heat water, by direct injection, by means of coil in tank and other methods all with disadvantages including greasy water, noisy operation, constant repairing, waste of heat, overheating, etc.

The "Efficient" Heater does away with most of these and makes it possible to supply hot water under all conditions continuously and at desired temperature. When used with a regulator it is a most economical method of heating water as steam is used only as water is drawn at the fixtures.

The Construction

The "Efficient" Water Heater, as Plate 8043-A, consists of a cast-iron outside cylinder with flanges at each end. In this cylinder is placed a nest of copper tubes so connected through the flanges that the steam can be passed through all the tubes at once while the water is circulating in the cylinder around the tubes. The tube section has free movement for expansion through a packing gland at the return end of the cylinder.

This improved form of construction in the "Efficient" Heater permits the removal of tubes from the cylinder without disturbing the water pipe connections. The steam pipes, flow and return, are disconnected and the top flange and bottom stuffing box gland removed, after which the tubes can be readily withdrawn, see Plate 8046-A, page 10. This is a very simple operation and the work can be done by any mechanic at the plant where the heater is in use.

The advantage of this construction will be apparent to those who are obliged to use water which carries solid matter in solution. In such cases this solid matter is gradually deposited on the heating tubes, coating them so rapidly that a thorough cleaning is frequently necessary.

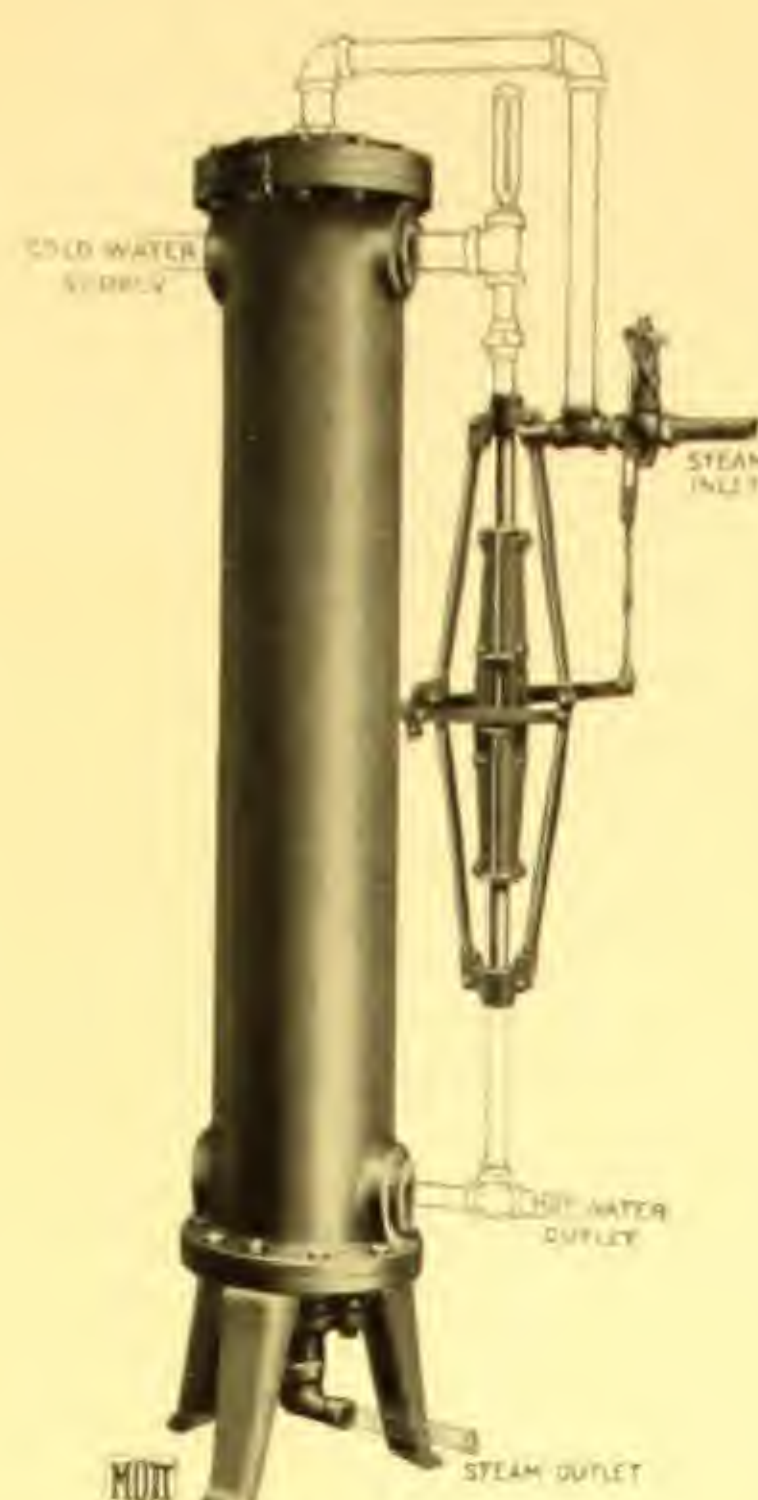


Plate 8045-A

As an Instantaneous Heater

Plate 8045-A shows the "Efficient" Heater set up with an automatic regulator and thermometer, and also shows the steam and water openings. This method of connecting the regulator is not always followed as different conditions require different methods of installation. Because of this no fittings are furnished between the regulator and heater. The steam return outlet should be connected with a trap which in turn should discharge into a sewer or be connected to a receiver open to the atmosphere, and the condensation pumped back to the boiler. It is always necessary to set the trap below the "Efficient" Heater so the tubes will be drained clear of the condensation.

Dimensions and Price List

Plate 8045-A "Efficient" Heater No.	Outside Diameter of Cylinder	Total Length of Heater Without Legs	Distance from Center to Center of Hot and Cold Water Connections	Diameter of Steam Feed and Return Nipples	Openings for Hot and Cold Water Pipes	† Gallons of Water Heated from 50° to 150° per hour, with 40 lbs. Steam pressure	§ Price with Cast Iron Cylinders without Controller and Valve	Size of Valve Supplied with Automatic Controller for 40 lbs. Steam pressure	§ Price with Cast Iron Cylinder with Controller and Valve for 40 lbs. Steam pressure	Size of Valve Supplied with Automatic Controller for low pressure 5 to 15 lbs.	§ Price with Cast Iron Cylinder with Controller and Valve for low pressure	Size of Valve Supplied with Automatic Controller for exhaust steam below 5 lbs.	§ Price with Cast Iron Cylinder with Controller and Valve for exhaust steam
1	3 1/2"	43 1/2"	31"	1 1/4"	1 1/2"	75	\$ 30 00	1"	\$ 70 00	1 1/4"	\$ 73 00	1 1/4"	\$ 73 00
2	5"	52"	37 1/2"	1 1/2"	2"	150	50 00	1 1/4"	95 00	1 1/2"	98 00	1 1/2"	98 00
3	6"	64 1/2"	49"	2"	2 1/2"	250	70 00	1 1/2"	120 00	2"	127 00	2"	127 00
4	7"	66 1/2"	49 1/2"	2"	3"	500	90 00	1 1/2"	150 00	2"	158 00	2"	158 00
5	8"	75"	57 1/2"	2 1/2"	3"	750	120 00	2"	180 00	2 1/2"	187 00	2 1/2"	187 00
6	9 1/2"	77 1/2"	56 1/4"	3"	4"	1200	180 00	2"	250 00	2 1/2"	258 00	3"	283 00
7	11"	77 1/2"	56 1/4"	3"	4"	2000	250 00	2"	320 00	2 1/2"	328 00	3"	353 00
8	15 1/4"	85 1/2"	55 1/4"	4"	5"	3000	350 00	2 1/2"	440 00	3"	468 00	4"	492 00
9	19 1/2"	84"	55 1/4"	4"	5"	5000	450 00	3"	545 00	4"	564 00	4"	564 00

† With steam at ten pounds pressure the capacities will be about 25 per cent less and with exhaust steam about 50 per cent less than with 40 pounds steam.

§ All iron parts can be furnished galvanized at an extra cost of 10 per cent. Legs are extra per set, \$3.00. None are made for heaters No. 1 and 2. Heaters made of cast brass can be furnished—prices quoted on application.

The "Efficient" Heater was designed to take the place of the cumbersome and unsatisfactory coil tank. It is frequently used in connection with a storage tank, in fact, should be invariably installed with one when low pressure is used for heating the water.

When high pressure steam is used a storage tank is not necessary, but it is customary to use an automatic controller to shut off the steam when the water is heated to the proper temperature.

In some sections of the country it is necessary to guard against rusting. This is usually done by having all cast iron parts of the heater galvanized. It is also necessary to use galvanized heaters when using them for salt hot water supply. Heaters made of special bronze can also be furnished for such cases.

A very important feature concerning the "Efficient" Heater is its adaptability. It can be used vertically or slanted at any angle that will cause the condensation to drain from the heater. If necessary it can be placed horizontally, in which case, however, the steam is fed at the reverse end in order to permit the use of return tapping in the rigid head of the heater. See Plate 8046-A.

The Cast Iron Cylinder

Plate 8046-A illustrates the simplicity of the "Efficient" Heater which is one of the strongest arguments in its favor.

When this heater was first brought out the cylinder was made of wrought iron, later, with other improvements the construction was changed to cast iron, thus making it proof against rapid disintegration, the common occurrence with wrought iron tanks with coils. Wrought iron when not protected from oxidation is much shorter lived than cast iron.

Cleaning

To take the "Efficient" Heater apart it is merely necessary to disconnect feed and return steam connections and then by removing the head as shown by Plate 8046-A the tubes can be withdrawn.

Some waters contain more or less solid matter in solution, commonly lime, which is precipitated by heat on the surface of the tubes, thus insulating and preventing the heater doing its work. In such cases it is necessary to remove the tubes and thoroughly clean them.

The process of cleaning is usually to immerse the set in a bath containing a 10 per cent. hydrochloric acid solution in which it will be found necessary to leave the tubes about five hours.

The Tube Section

Plate 8047-A shows a nest of the "Efficient" Heater tubes. They are constructed of copper and expanded into cast iron heads at each end by means of small expanding thimbles.

The tubes used in both the "Efficient" and "Tobey" Heaters are special, and when they have to be replaced we recommend that they be purchased from us. Prices on extra sets of tubes will be furnished on application.

In Plate 8047-A is shown a separating plate that prevents the tubes drawing close together which would reduce the available space for circulation of water; this also helps to keep the tubes under uniform tension.

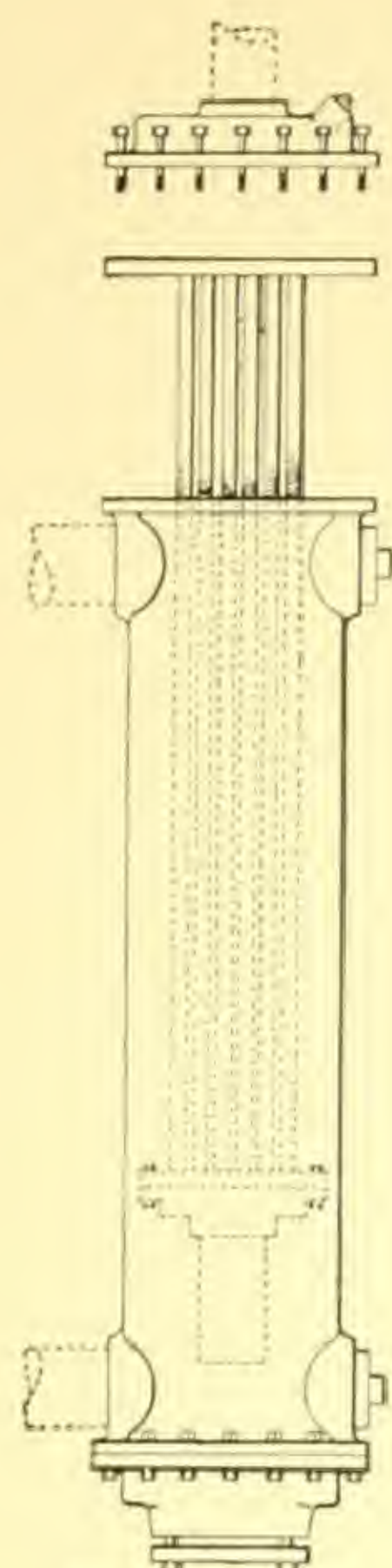


Plate 8046-A

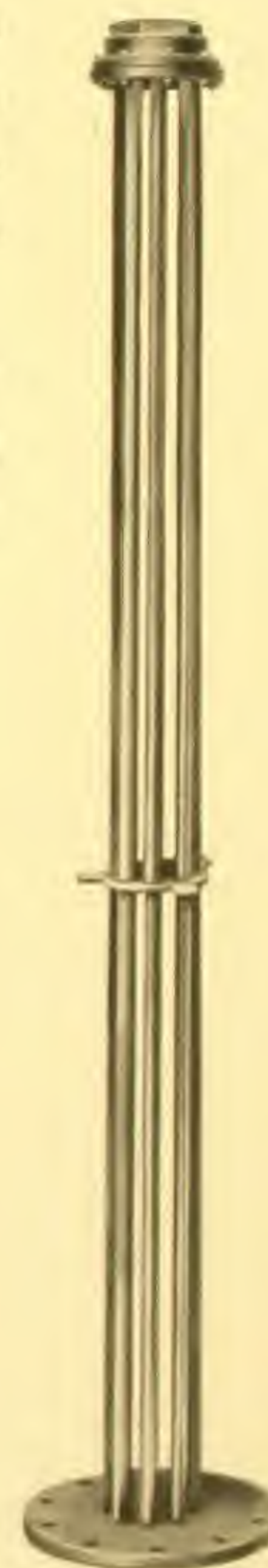


Plate 8047-A

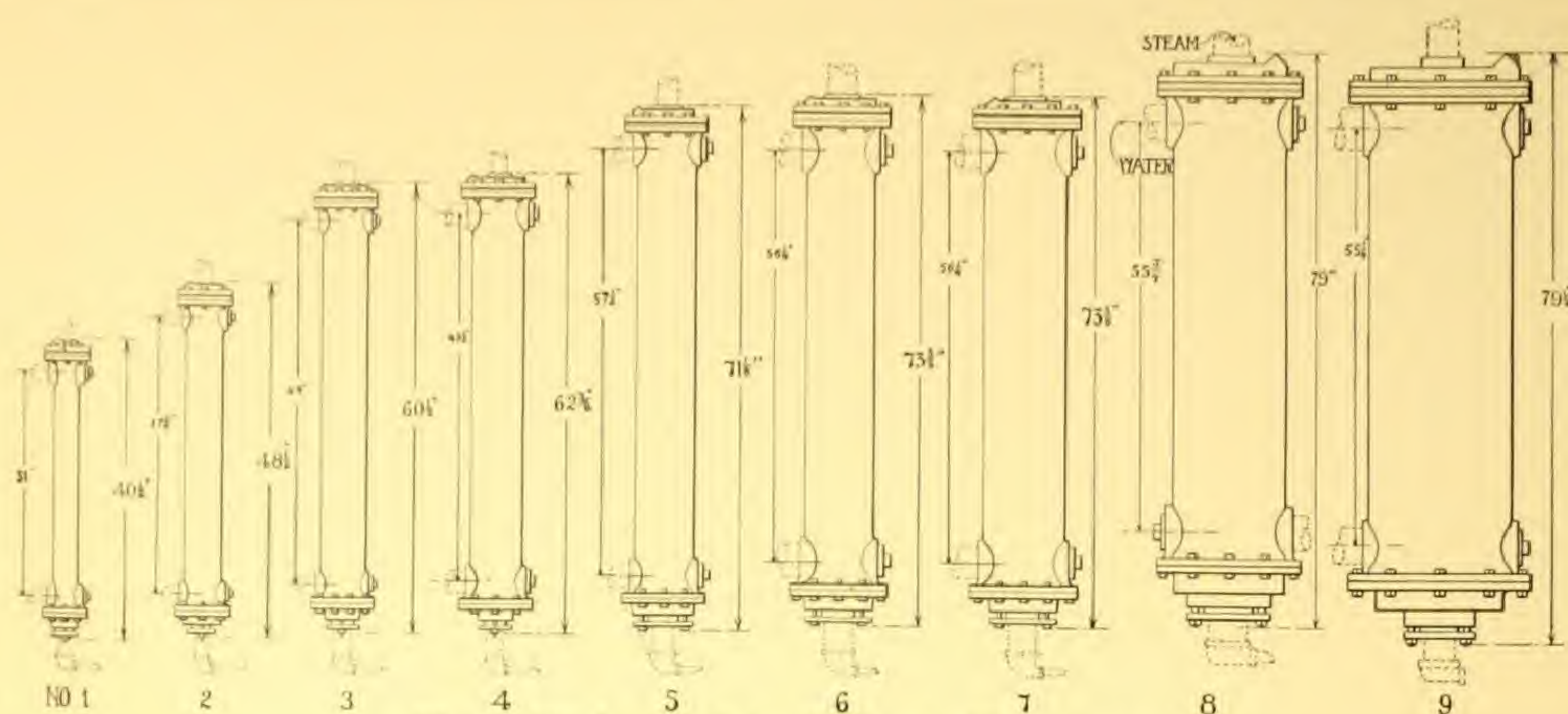


Plate 8048-A. "Efficient" Heater Measurements.

Dimensions of Heaters and Regulators

The lengths of "Efficient" Heaters are indicated by Plate 8048-A. We furnish with our heaters reducing elbows shown by dotted lines at base of heaters which increase the overall dimensions as follows: For No. 1, 3"; No. 2, 3 1/2"; No. 3, 4"; No. 4, 4"; No. 5, 4"; No. 6, 4"; No. 7, 4"; No. 8, 6 1/2"; No. 9, 6".

At the bottom of the page are shown cut and dimensions of the "Lawler" Regulators, Plate 8049-A, and on the following page is Plate 8062-A which shows the large size regulators with valves.

The size of valves corresponding to the numbers of regulators are given in the table on page 12. To obtain proper results all orders should state the pressure of steam to be used and call for the proper size valve for the given pressure. Proper results also depend on the heater being properly installed with the return end above the water line of steam boiler or the steam trap. On the following pages we give information and suggestions on this subject.

The tappings in the cylinders are made extra large to permit of using large connections for circulation purposes. It is always advisable to use the largest connections possible.

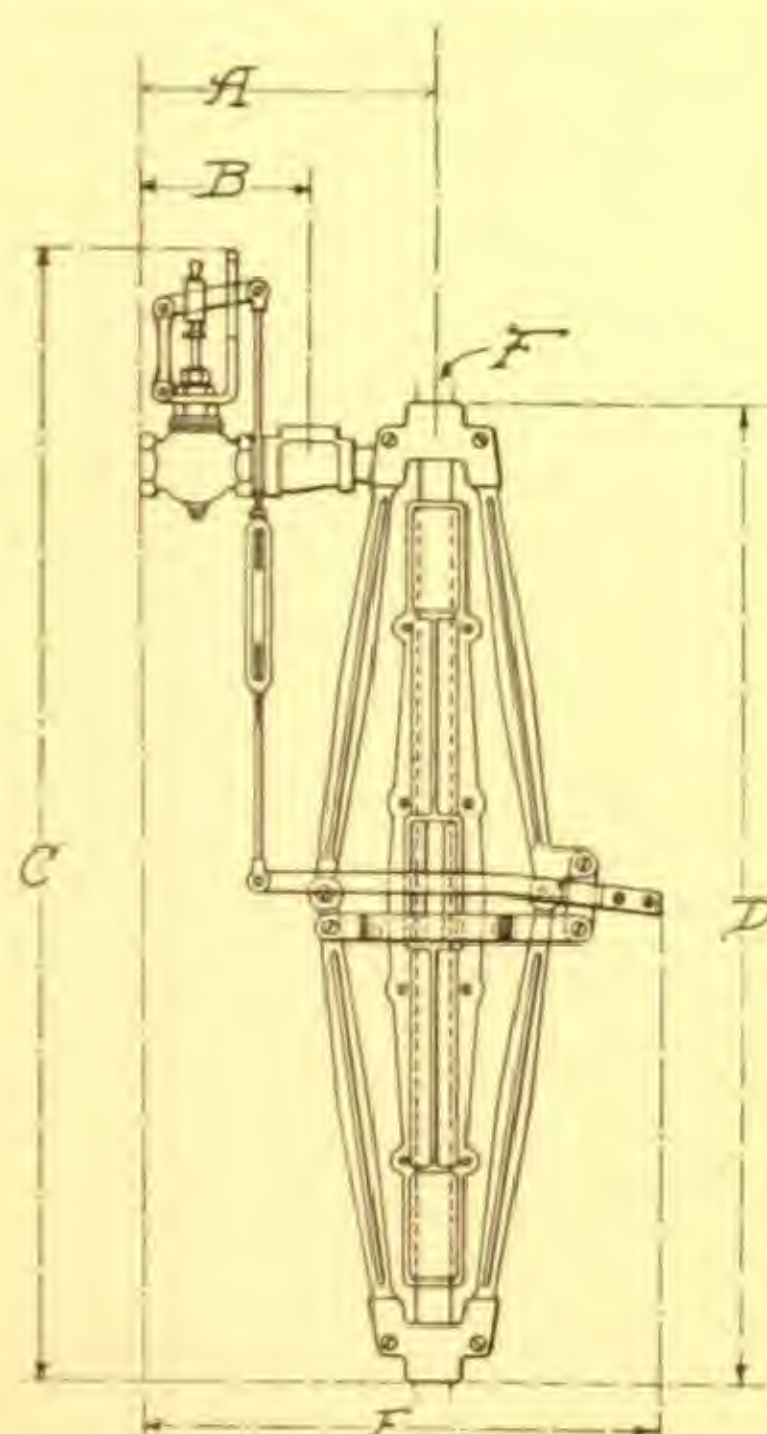


Plate 8049-A. "Lawler" Regulator

Dimensions of Lawler Regulators: Plate 8049-A

Number	1	2	3	4	5	6	7
A	8"	9 1/2"	10 3/4"	12"	13"	14 1/2"	15"
B	4 1/2"	5 1/4"	6"	7"	7 3/4"	10"	10 1/2"
C	35 1/4"	37"	44 1/2"	45"	45"	51 1/2"	52"
D	31"	31"	31"	39"	39"	44"	44 1/2"
E	15 1/2"	17"	18 1/4"	19"	20"	23 1/2"	24"
F	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"

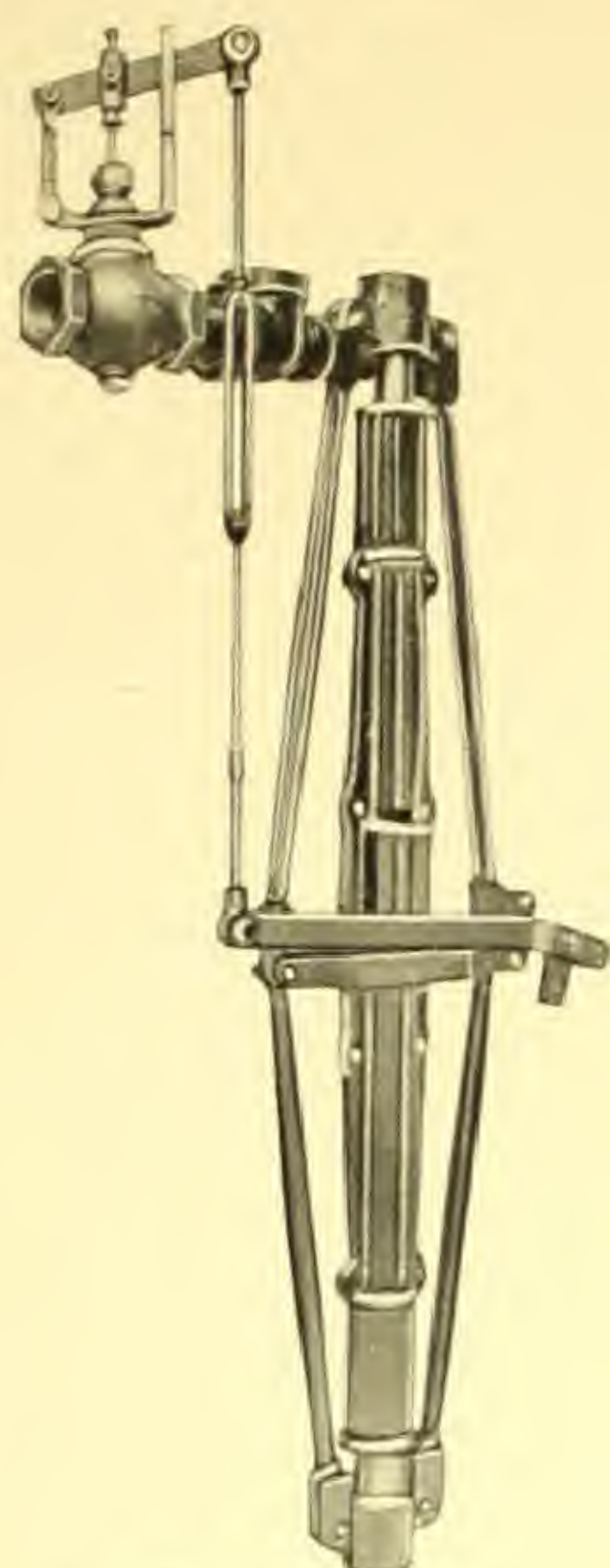


Plate 8061-A
Lawler Regulator.

Lawler Thermostatic Regulator

The "Lawler" Regulator operates on the same principle as the self-contained regulator in the "Tobey" Heater, that is, by expansion or contraction of a brass or copper tube through which the heated water passes.

This expansion and contraction gives an absolutely uniform movement to the parts affected thus producing a reliable thermostatic action.

Close Regulation

The difference in temperature between water and the steam used to heat is so great that it is not feasible in all cases to produce an absolutely uniform result without some kind of secondary regulation. For example, with water at say 50° and steam at 240°, it is difficult to bring these two together and produce a uniform tepid water, say ranging from 101° to 105°. To accomplish this the first regulator should be set to give about 110° to 120° or somewhat higher if desired, then some

form of secondary regulator should be used to reduce the temperature to the desired degree. Thermostatic regulators, shown on pages 22, plate 3128½-A; 23, 3191-A; 3193-A and mixing chamber plates 3079-A, 3080-A and 3127-A (cuts of which will be mailed if requested), can be used for this purpose.

Attention is also called to the "Thermo" Anti Scalding Valve, page 27, plates 3087-A and 3088½-A.

Certain manufacturing plants may require water at temperatures from 160° to 200° and such cases must be given special consideration. Correspondence is invited when conditions of this kind have to be met.

Examples of installations of the "Lawler" Regulator are shown in Plates 8045-A, 8053-A and 8054-A.

It will be noted that the same regulator can be used both for the regulation of the steam, and the dampers of the tank heater, but such requirement must be stated when regulator is ordered.

Lawler Regulator—Plate 8061-A

No.	1	2	3	4	5	6	7	8	9	10
Size Valve	¾	1	1¼	1½	2	2½	3	4	5	6
Price, Each	\$60.	\$65.	\$70.	\$75.	\$85.	\$95.	\$125.	\$150.	\$175.	\$200.

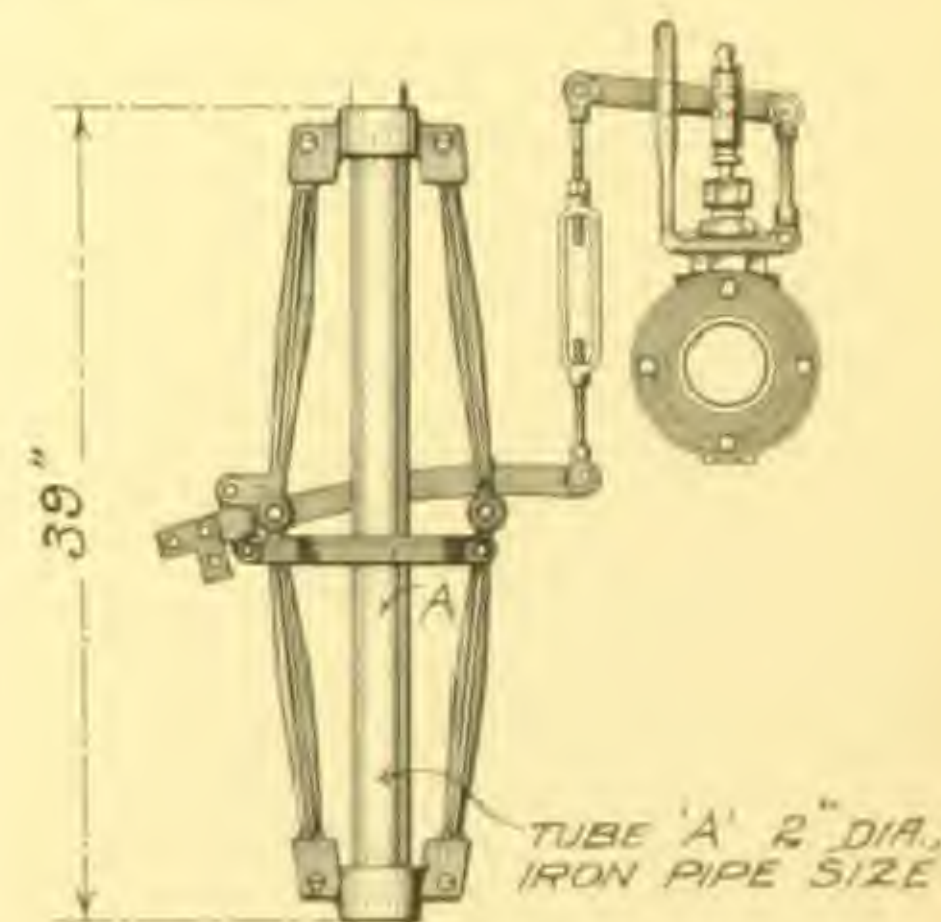


Plate 8062-A
Lawler Regulator Nos. 8, 9, 10

NOTE—For dimensions of smaller regulators, see page 11.

Apartment and School Houses

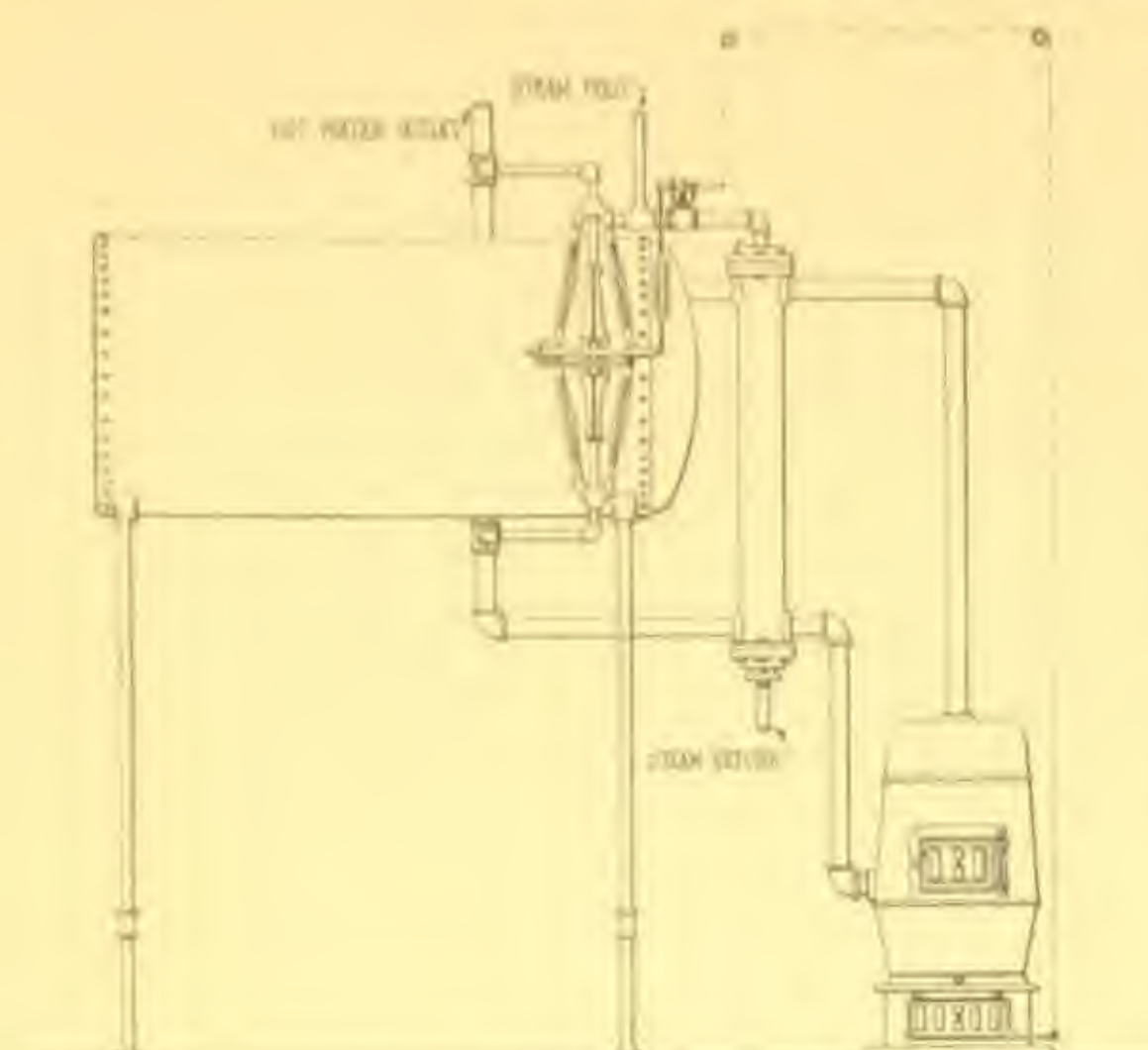


Plate 8063-A

For apartment houses, schools or other buildings an excellent outfit is shown by Plate 8063-A.

In Winter the steam supply can be taken from the heating boiler or other source and it will not be necessary to use the tank heater except on occasions when a larger quantity of hot water is required, for instance, wash days; or in a bathing establishment during rush hours.

The feature of such installations is the economy in operation combined with the fact that maximum or minimum requirements can be more easily met.

In Summer it is customary to use the hot water heater only, but when there is demand for more water, the steam heater can be operated long enough to take care of the additional requirements. The conditions in the winter time are reversed, the steam heater being the regular supply and the water heater the emergency.

Duplicate Equipments are Advantageous.

Plate 8064-A shows a duplicate apparatus having the "Efficient" Heaters horizontally suspended beneath the tanks and connected with "Lawler" automatic temperature regulators on the separate steam supplies.

The advantage of having a duplicate outfit is, first, maximum or minimum supply as occasions require; second, in case of an emergency one of the outfits can be depended upon while the other is being repaired or cleaned.

The main steam pipe (marked steam feed) must be equal in area to the area of the two connections to regulator valves so as to give ample supply of steam.

In school buildings particularly, we strongly recommend the use of outfits of this kind as the capacity of the hot water heating outfit is taxed most severely during one or two hours of the day.

The use of storage tank is recommended in every case where low pressure steam, 15 lbs. or under, is in use, and the tank should be large enough to carry a supply for rush hours, because with low pressure it is not always possible to heat large quantities of water as rapidly as might be required.

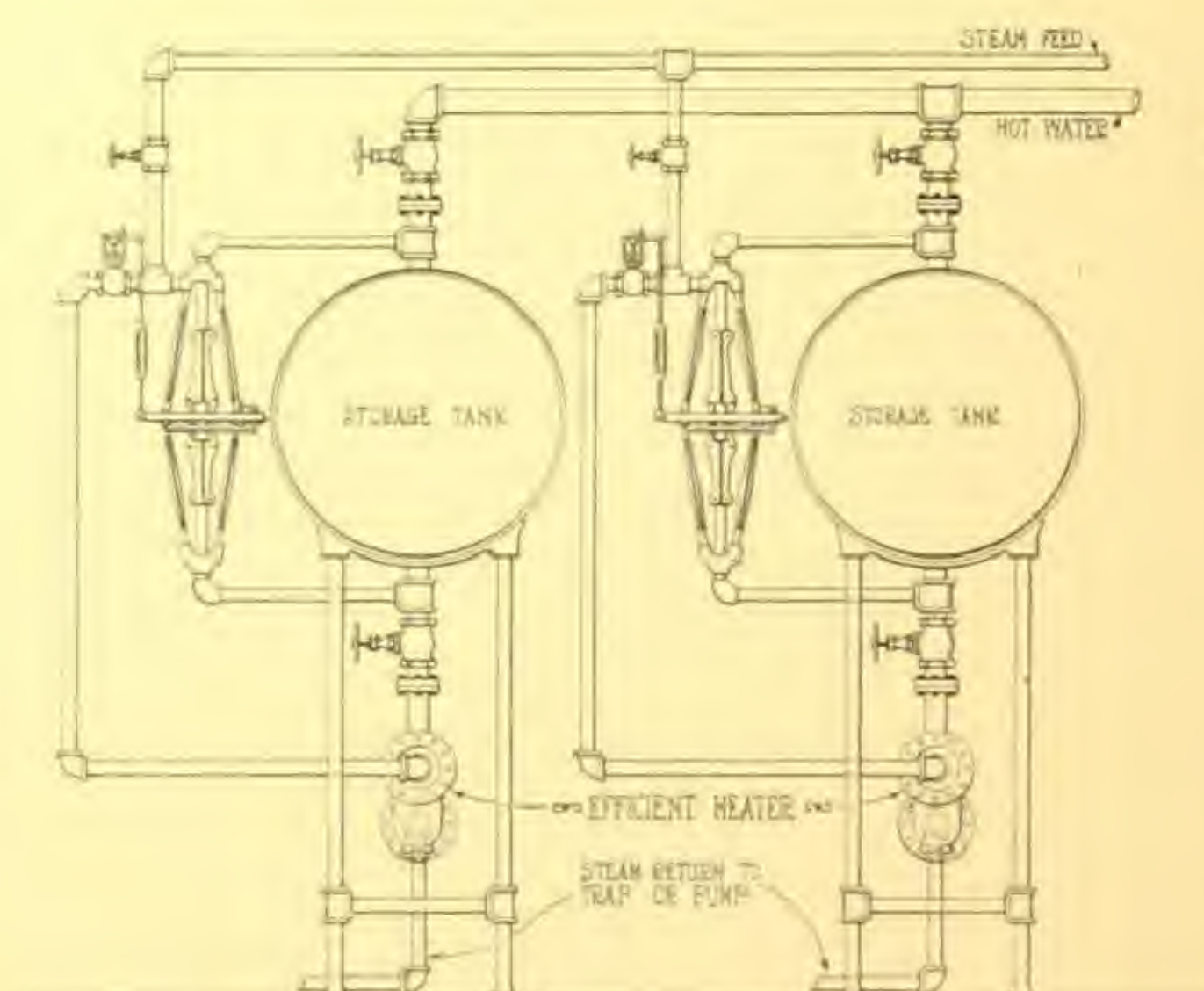


Plate 8064-A

Methods of Installation

There are many ways of installing the "Efficient" Heater.

Plate 8065-A shows the "Efficient" Heater placed beneath a storage tank thus economizing floor space. It is placed slanting so that the tubes will drain. When erecting an "Efficient" Heater in this way special offset flanged fittings will be found useful.

The heater must, in all instances, be placed so that the condensed water does not remain in the tubes. In the case of low pressure, if it is desired to take the steam return back to the boiler, the "Efficient" Heater must be placed above the water line of the steam boiler, otherwise the tubes will be subjected to severe strain and may crack.

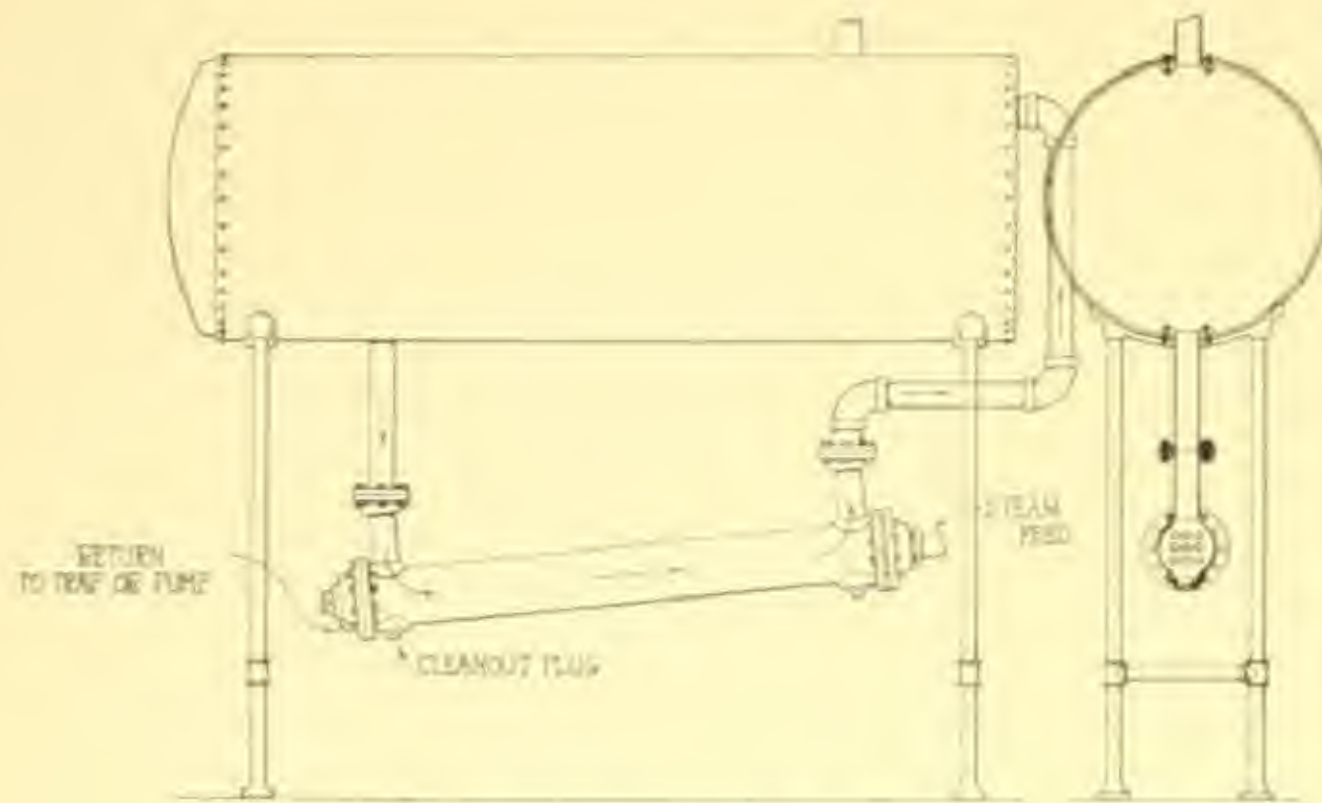


Plate 8065-A

Importance of Height of Water-Line

Plate 8066-A shows one method of raising the return end of the heater above the water line of a steam boiler and it also shows that the heater can be cross connected with an auxiliary "Mott Sunray" Tank Heater for use in summer or when steam supply may not be available.

The lower end of the "Efficient" Heater may be raised even higher than shown here without retarding the circulation, the limit being about a foot above the bottom of tank; it is essential to keep it 18" or more above water line of steam boiler if the condensation is to be returned to the boiler by gravity.

These two plates show installations where exhaust, low pressure or intermittent high pressure steam is used in any of which cases it is best to use storage tanks. A "Lawler" Regulator is necessary in the latter instance, otherwise when high pressure steam is turned on, the water might be overheated. Regulators can, however, be used in any of these conditions if desired.

Cut-off Valves

Extra plugged tapings are provided in each heater through which the tubes can be examined at intervals while heaters are in use. Thorough flushing tends to keep the heater free of sediment and in a condition to work efficiently.

To enable the engineer to clean the heater without drawing all the water from the system, valves should be provided on the flow and return water pipes, but in such cases, always have a safety valve on the heater to relieve pressure if by mistake the steam supply is left turned on and the small quantity of water in the heater overheated or turned into steam.

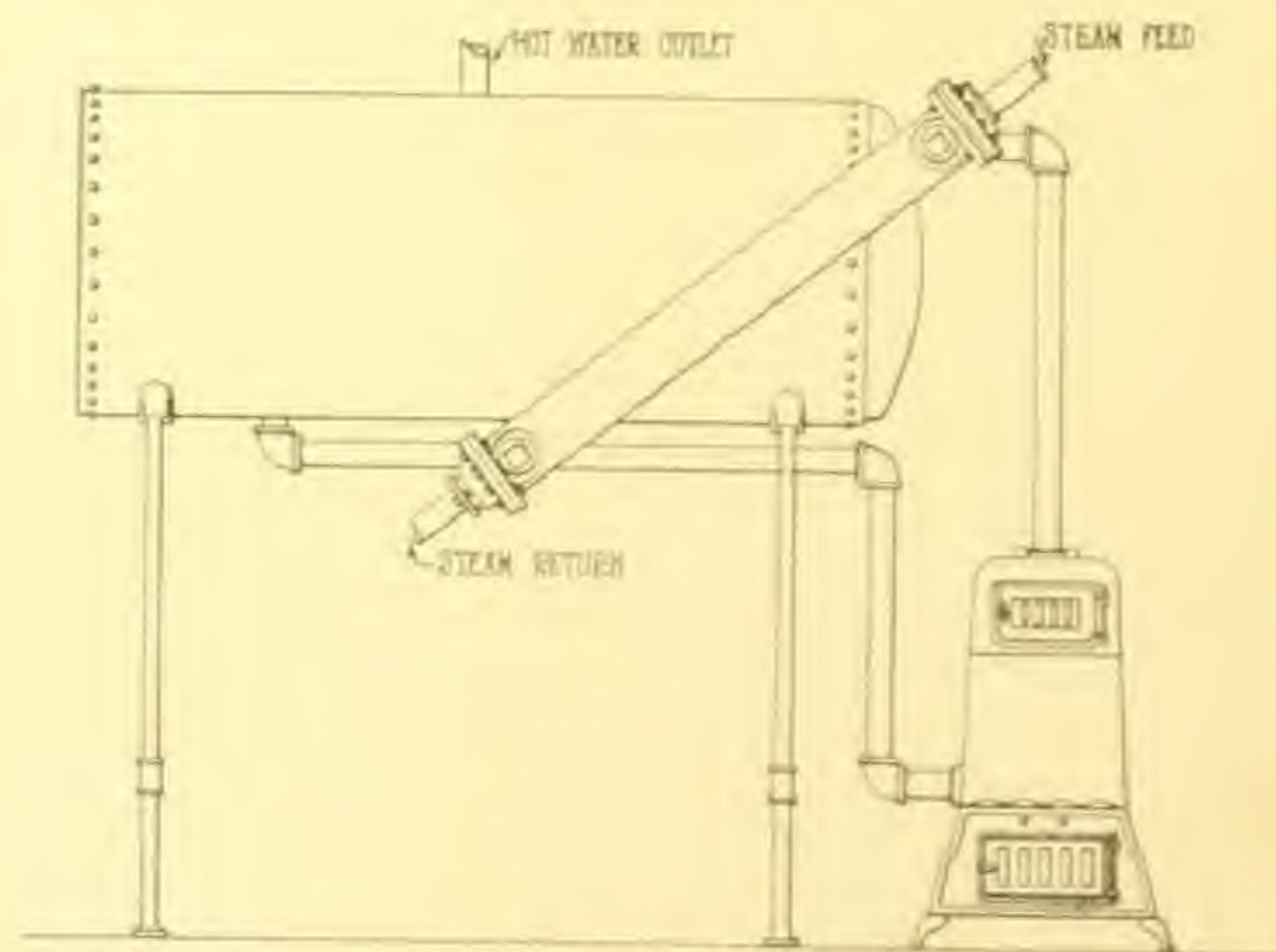


Plate 8066-A

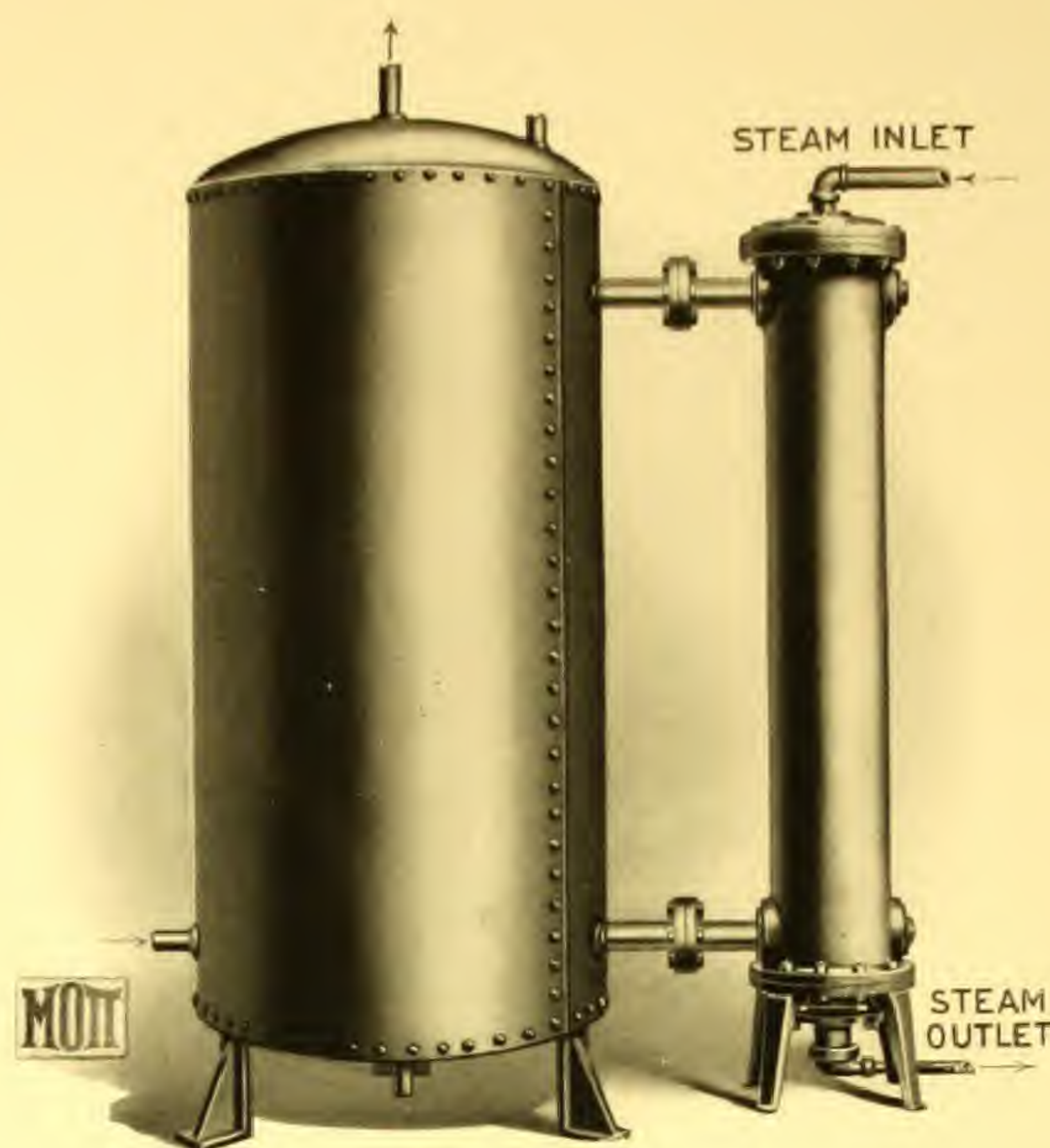


Plate 8067-A

For Unsteady Exhaust or Low Pressure

Plate 8067-A shows an excellent arrangement where there is a high pressure steam supply for engines, etc., the entire year round and considerable exhaust steam is available for the hot water supply.

In a case of this kind it is not usually necessary to have an automatic regulator as the water in the storage tank cannot very well be overheated, therefore, the regulator is of little value unless there is a cross connection for high pressure steam or the conditions require a low, fairly uniform temperature.

The illustration shows the heater and tank both set on legs in vertical position, but different arrangements can be made to suit conditions. In all instances it is essential that the steam trap be placed below the discharge from the "Efficient" Heater, otherwise the tubes will be flooded and when steam is turned on after the heater has been out of use for some time water hammer will be caused and the tubing in the heater strained.

If the steam boiler capacity is small compared with the amount of work required, an installation of this type is best as the water can be heated when steam is available and as the storage tank contains a large quantity, it will supply fixtures during the time the heater is not producing hot water. In the event of high pressure steam being used in an emergency a regulator should be used to prevent overheating.

If it is desired to put valves on the feed and return connections between the tank and heater, care must be taken to put a safety valve on the apparatus at a convenient point. This may be in some tapping not used for circulating purposes but need not be placed directly on the "Efficient" Heater.

Valves will be found useful in case it is desired to clean the heater tubes as their use makes it unnecessary to drain the hot water system when cleaning the heater.

Hotel and Restaurant Supply

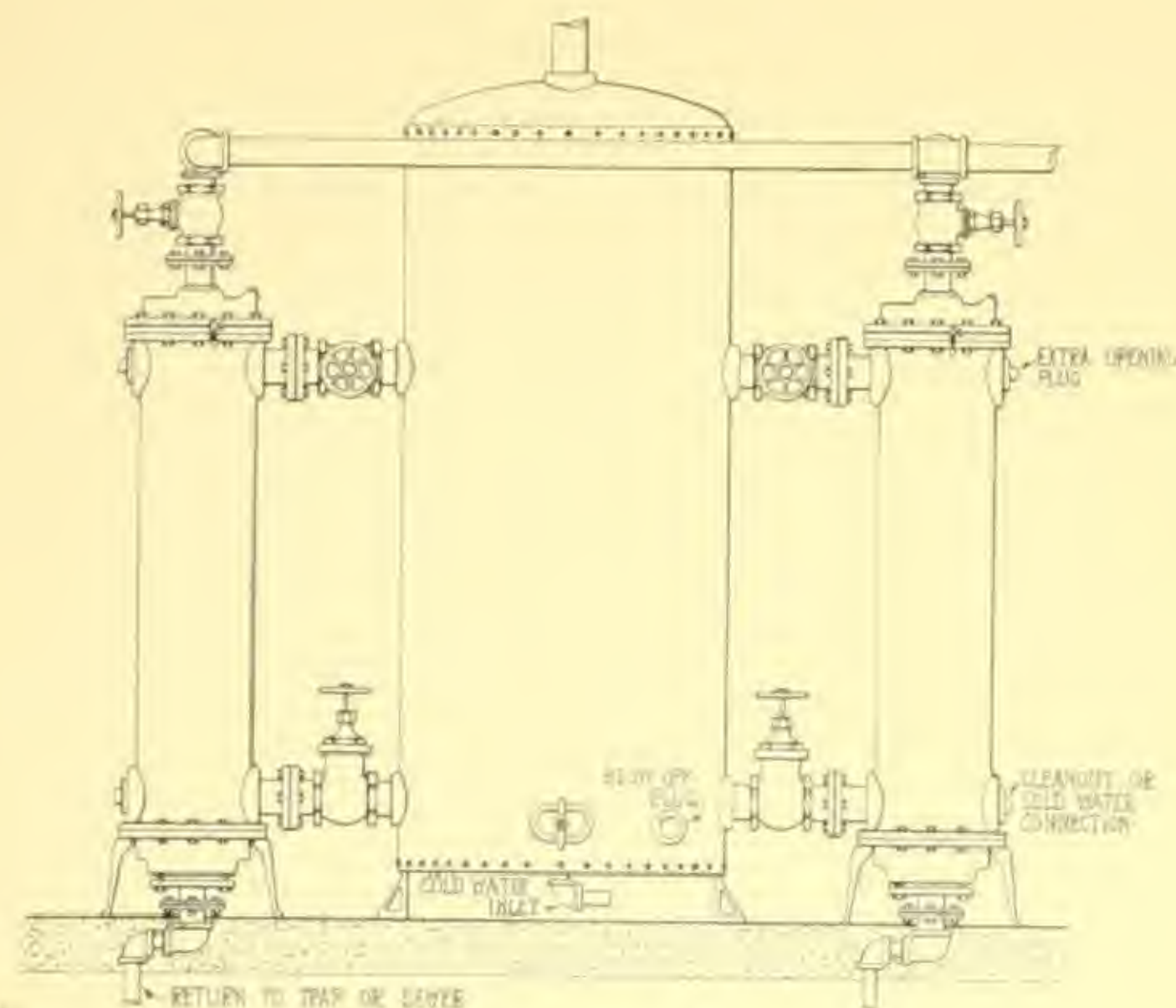


Plate 8068-A

In hotels and restaurants plants as shown by Plates 8068-A and 8069-A should be installed. In each case it will be noticed that two "Efficient" Heaters are used with one storage tank.

There is nothing more disconcerting to a hotel keeper or apartment house superintendent than a shortage of hot water and this must be carefully considered by the engineers in charge of the erection of such buildings.

There are problems to be studied such as the composition of the water, whether it contains lime in solution, is clean or thoroughly filtered, and just what the quantity requirements will be during "rush hours."

There are cut-off valves between the heaters and tank so that either one or both may be used at will.

If it is necessary to clean one heater, the other one can be in operation. Such installations should always provide for an unexpected rush.

The main steam feed must be equal in area to the area of the combined connections to the heaters so as to give ample supply of steam.

Safety valves are shown in Plate 8069-A; such valves should be provided on all installations where valves are used to prevent the circulation of water through the heater. If no safety valves are used the contents of heater may be turned to steam and with no outlet for expansion undue pressure might be generated with disastrous results.

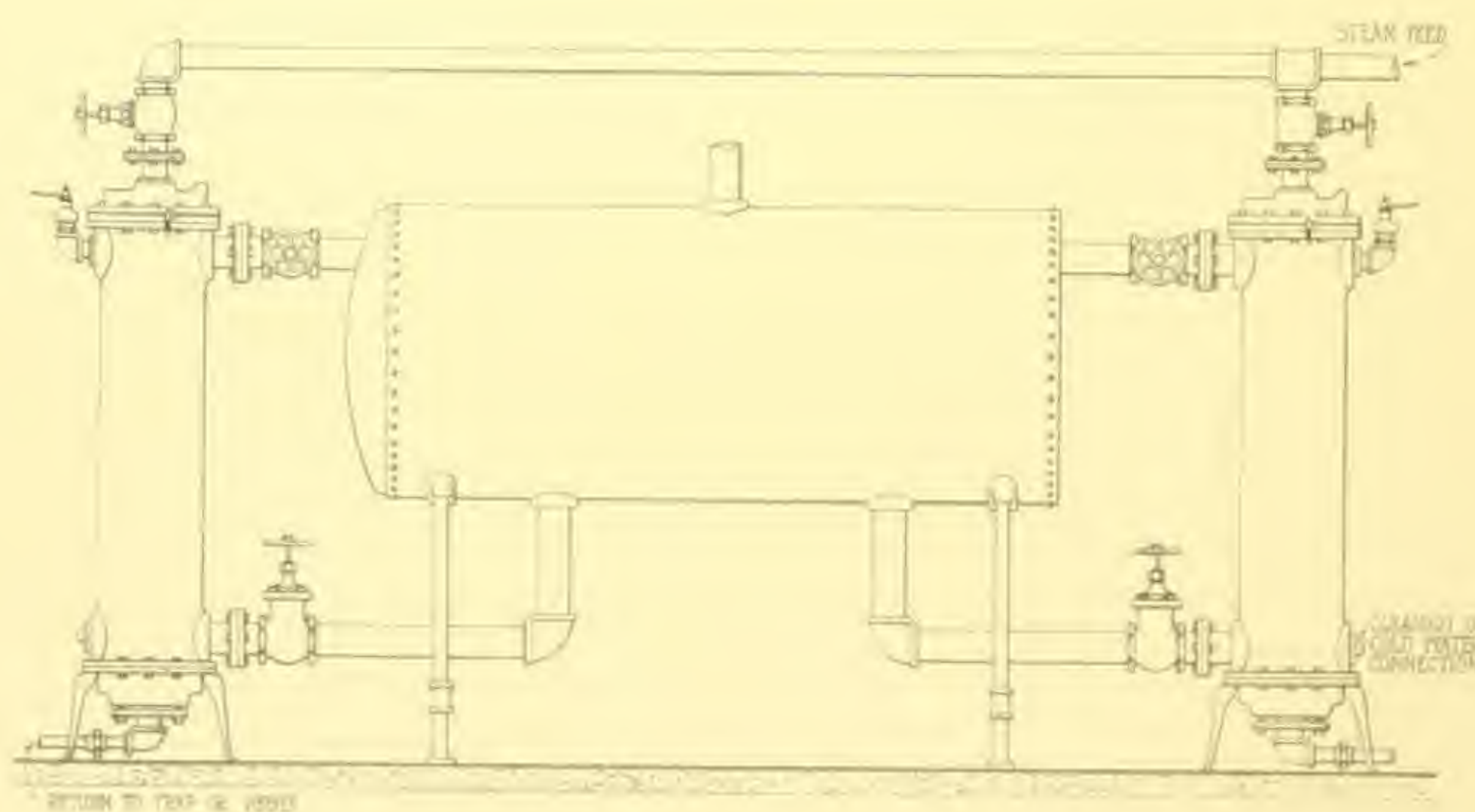


Plate 8069-A

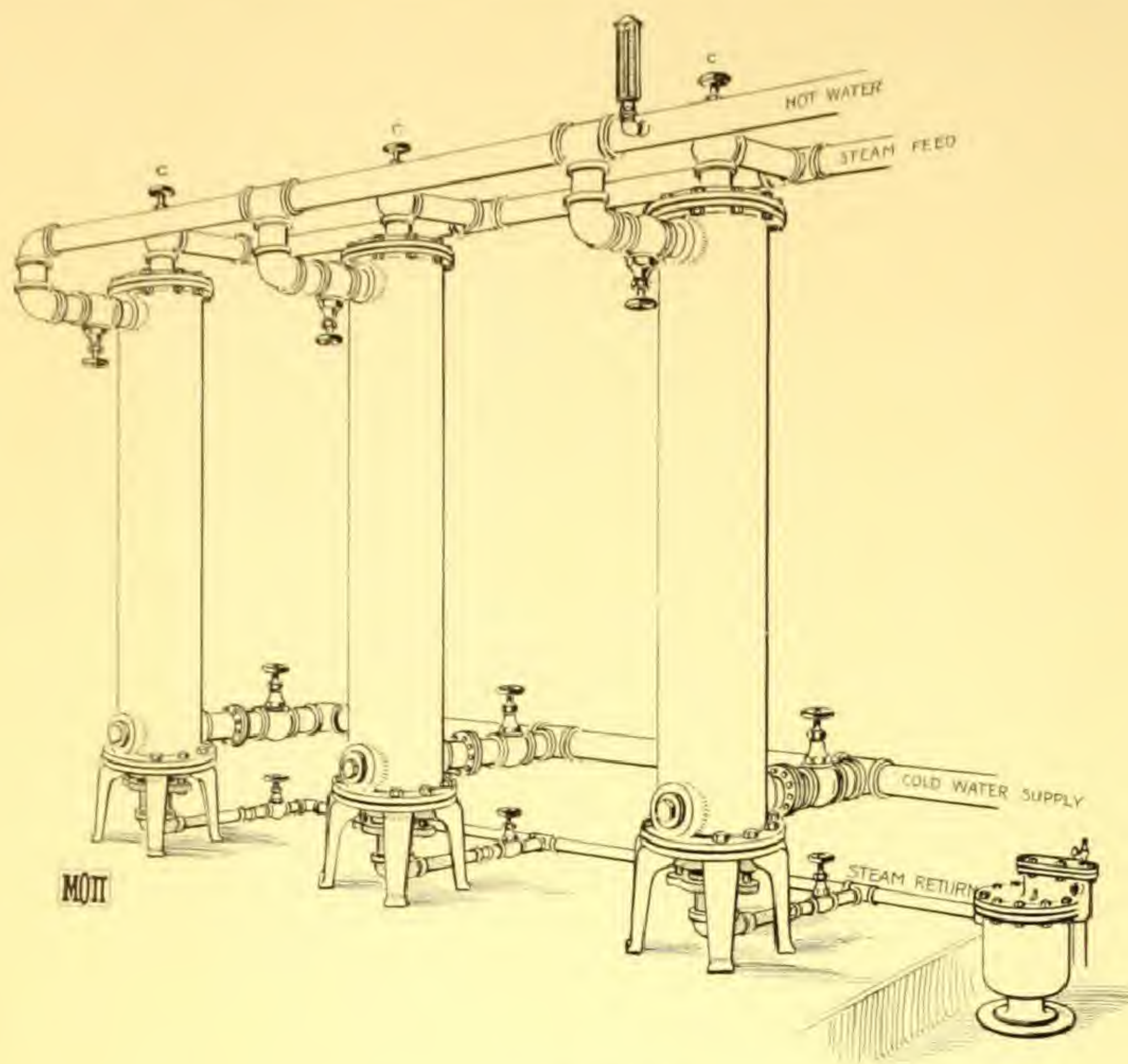


Plate 8070-A

In most of the foregoing illustrations of the use of the "Efficient" Heater, it is shown in connection with storage tanks for utilizing exhaust, low or high pressure steam supply, but there are many instances where storage tanks are not necessary, and many others where there is not room for them.

Plate 8070-A shows a battery of three heaters without any storage tank, in which case steam at a steady pressure, not to exceed 50 lbs., is necessary to obtain the most satisfactory results.

When installing a system of this kind, valves should be placed so that any one of the heaters may be disconnected.

Unlimited Supply by Use of Batteries

Care should be used to feed the heaters through valves (C) of the size specified in our table, page 9. In the case of batteries a steam feed (A) should be run of ample size to feed all heaters at one time. It is also essential that the main steam return to the trap be equal to the combined area of the drips from heaters.

A temperature regulator of suitable size to take care of the entire battery should be connected to a balanced valve on the steam main. The regulator should be connected to the hot water main and the cold water supply so as to produce a circulation.

Water may be heated in this way for various purposes, including hot water heating systems, gravity circulation or forced circulation. In the latter case the temperature of the water can be adjusted to the temperature required for heating the building, and a schedule can soon be arranged so that the engineer in fireroom can make adjustment each day without it being necessary for him to go through the building and test temperatures.

Care must be exercised in placing the steam trap. It should be below the level of steam outlet from heaters. This is essential as otherwise the lower section of the tubes will become flooded and each time steam is turned on the contact with the cold water will cause severe strain on the tubes and possibly cause leaks or breaks.

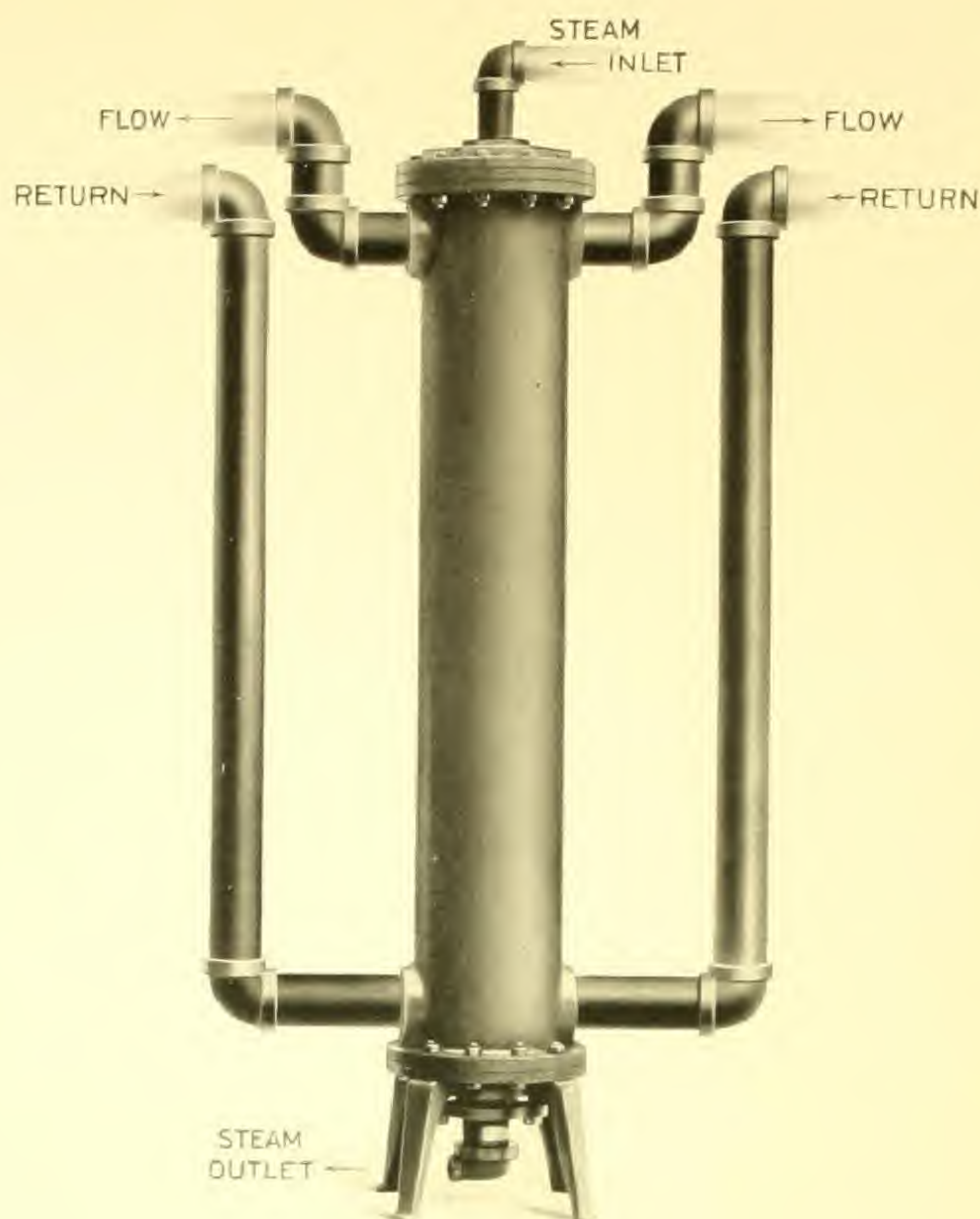


Plate 8071-A

Heating Buildings

Plate 8071-A shows the "Efficient" Heater connected for a double main hot water circulating system which may be either gravity or forced circulation. Steam at any pressure can be utilized in such an outfit but we recommend keeping it at 50 lbs. or under to get the best results. The heater or heaters should be proportioned to the steam pressure supplied and amount of work to be done.

In many places there are electric and other companies who supply steam for heating. Houses already heated by hot water can utilize steam from these sources by means of the "Efficient" Heater producing a very economical and efficient installation.

The "Efficient" Heater is superior to a wrought iron heater with spiral or other type of coil.

If necessary the heater can be placed inclined or horizontally. A regulator to control temperature will prevent overheating and waste of steam.

Scattered Buildings

Plates 8070-A and 8071-A show two methods of installing "Efficient" Heaters adapted for isolated buildings.

In cases of groups of buildings such as Colleges, Hospitals, Greenhouses, Army Posts, Factories, Municipal Buildings, etc., a hot water heating plant is admittedly the most serviceable.

In Greenhouses, the various temperatures required can be maintained automatically without complicated mechanism. Each building or section of a building can be furnished with the proper size heater and regulator which can be set for the proper temperature.

The heating is under the control of the engineer, who can set the regulators to raise the water to proper temperature each day or with each change in the weather. He can feed the heaters with exhaust, live steam or both as the conditions require.

Size of Heater

The number of square feet of heating surface (exclusive of piping and provided all piping is properly covered and radiation properly proportioned) that the "Efficient" Heaters will supply when using 40 lbs. steam pressure is as follows:

No.	1	2	3	4	5	6	7	8	9
Square feet	180	360	600	1200	1800	2800	4800	7200	12000

The capacities vary with the steam pressures approximately one-half the rating when exhaust or low pressure up to 9 or 10 lbs. is used and three-fourths the rating when low pressure of 10 lbs. or above is used—do not use steam over 50 lbs. for best results. Always use a steam trap. We illustrate the "Lawler" and "Tobey" types, page 21, either of which will be found satisfactory.

Greenhouses

In heating greenhouses the consideration of the cubical contents may be overlooked as the glass exposure is so great as to constitute almost the sole cause of the loss of heat.

If the house is 100 feet long and 20 feet wide there will be about 2,600 square feet of glass. If the house is to be heated to 50° or 60°, we would use one square foot of heating surface to three square feet of glass, equal to 866 square feet, which is equal to 1,485 lineal feet of 2" pipe. For ordinary work 2" wrought iron pipe will give the most satisfactory results. The following table gives a ready means of calculating the heating surface required with various sizes of pipe.

FOR ZERO WEATHER	TEMPERATURE OF HOUSE	
	50° to 60°	60° to 70°
Number of square feet of glass heated by one square foot of heating surface	3	2.25
Number of square feet of glass heated by one foot of 4-inch cast iron pipe	3	2.25
Number of square feet of glass heated by one foot of 3-inch wrought iron pipe	2.75	2.10
Number of square feet of glass heated by one foot of 2½-inch wrought iron pipe	2.25	1.80
Number of square feet of glass heated by one foot of 2-inch wrought iron pipe	1.75	1.30
Number of square feet of glass heated by one foot of 1½ inch wrought iron pipe	1.50	1.20

Efficient Heater with Range Boiler

Plate 8072-A illustrates an "Efficient" Heater connected to a galvanized range boiler. This shows a simple hot water supply for residences with low pressure steam heating boiler or with outside steam service. The hot water can be economically furnished and the dirt and inconvenience of a coal tank heater avoided. It also costs less to heat the water with steam than with gas; especially is this the case when a "Lawler" regulator is used.

The size heaters listed are suitable for low pressure steam and will heat contents of tank in about two or three hours.

Plate 8072-A. Dimensions and Capacities.

Capacity of Galvanized Range Boiler 250 lbs. test	Dimensions	Price including Heater without Regulator without Boiler Stand *	Price including Heater and Regulator without Boiler Stand *
30 gallons	5' x 12"	\$ 38 00	\$ 76 50
35 "	5' x 13"	39 00	77 50
40 "	5' x 14"	40 50	79 00
52 "	5' x 16"	42 50	81 00
63 "	6' x 16"	69 00	111 00
82 "	5' x 20"	73 00	115 00
100 "	5' x 22"	85 00	127 00
120 "	6' x 22"	91 00	132 00
144 "	6' x 24"	130 00	175 00
168 "	7' x 24"	140 00	185 00
192 "	8' x 24"	145 00	190 00

* Prices do not include pipe and fittings.

If a steam pressure of 20 to 40 lbs. is used a capacity corresponding to the size of tanks listed can be depended upon per hour. A steam trap is however necessary at this pressure and for the above outfits we recommend—30 gal. to 120 gal. inc. No. 0 $\frac{3}{8}$ " "Lawler" Steam Trap—144 to 192 gal. inc. No. 1 $\frac{1}{2}$ " "Lawler" Steam Trap, Plate 8073-A.

The above arrangement adapted for dairies, bottle washing plants, and in any place where steam is available and warm or hot water is required.

Always use a Temperature Regulator when using high pressure steam. If it is necessary to have water at two different temperatures for different purposes, use the Pneumatic Mixer, Plate 3192-A on page 23.

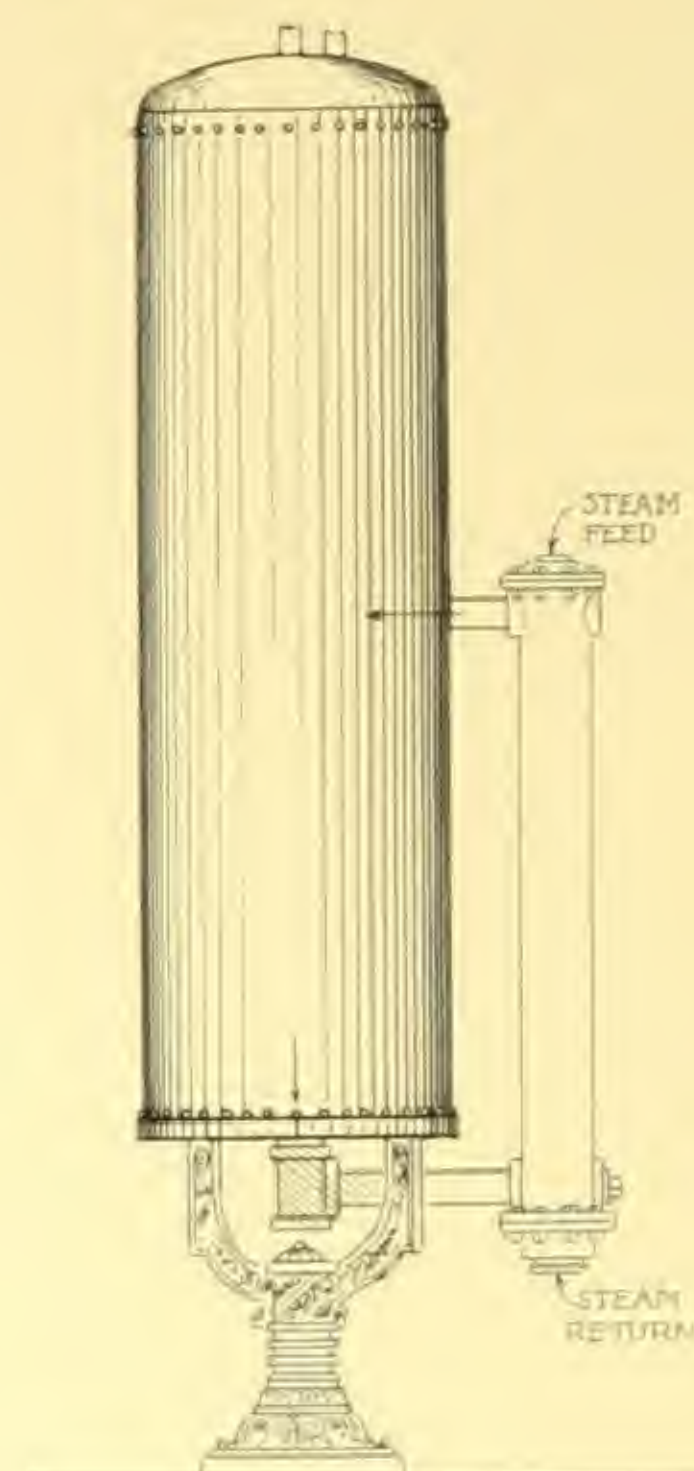


Plate 8072-A

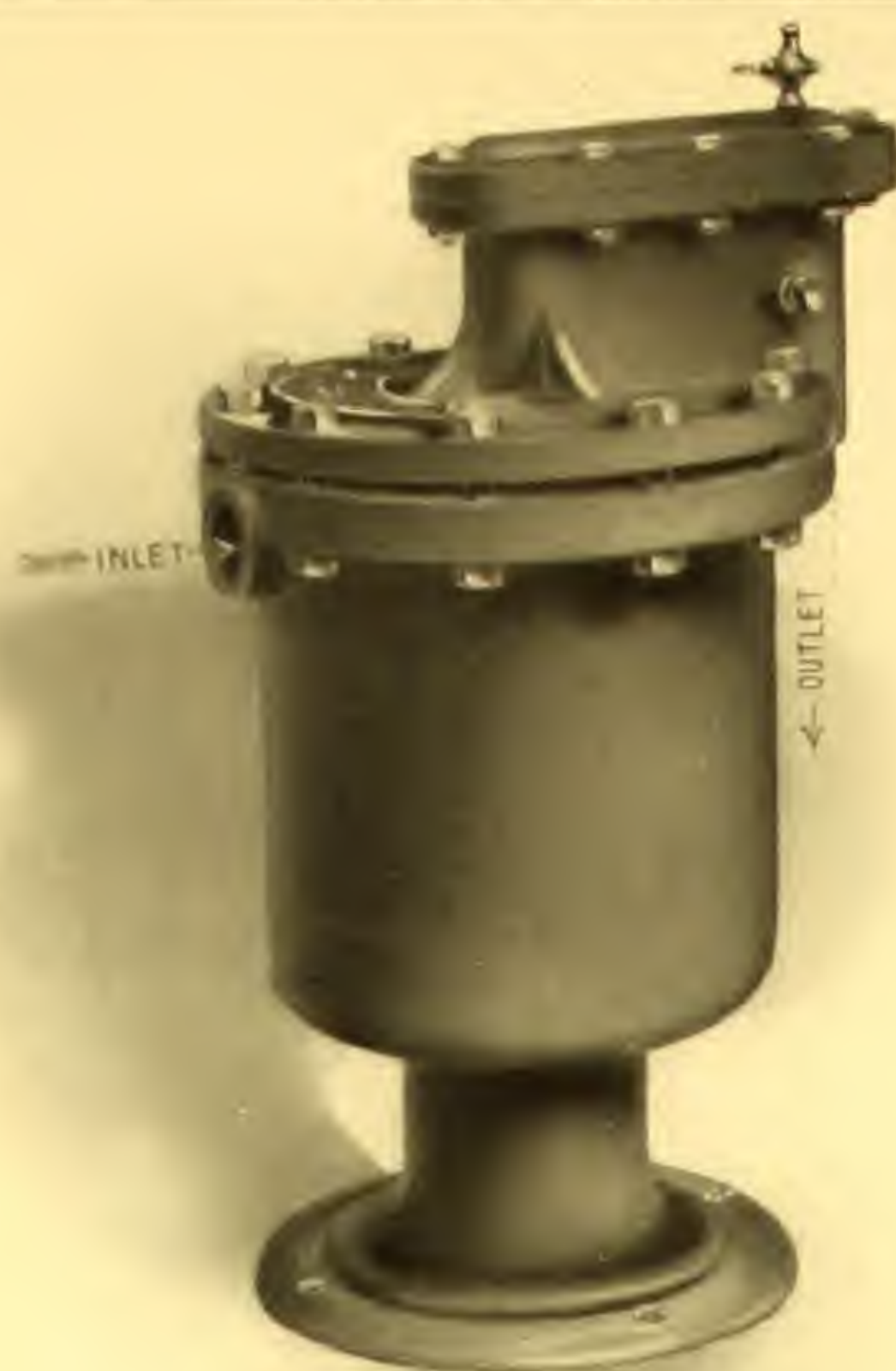


Plate 8002-A

BOILER STAND

Diameter	Plain	Galvanized	Bronzed
12"	\$1 35	\$2 25	\$1 60
13"	1 35	2 25	1 60
14"	1 50	2 50	1 75
15"	1 50	2 50	1 75
16"	1 70	2 85	2 00
17"	1 70	2 85	2 00
18"	1 85	3 10	2 15
20"	2 00	3 40	2 35
22"	2 10	3 50	2 50
24"	2 25	3 75	2 65

Height of regular standard, 21 inches. Extension piece to raise standard above 21 inches and not over 30 inches. Plain, \$0.40; galvanized, \$0.65; bronzed, \$0.45.



Tobey Steam Trap

Plates 8044-A and 8074-A.

Number	Size of Outlet	Size of Inlet	Capacity for Draining 1-inch Pipe	Price
1	$\frac{3}{4}$ inch	$\frac{3}{4}$ inch	6,000 feet	\$30 00
1½	$\frac{3}{4}$ "	$\frac{3}{4}$ "	9,000 "	40 00
2	1 "	1 "	20,000 "	50 00
2½	1 "	1 "	25,000 "	60 00

Condensation is admitted through the pipe to the body of the trap, which causes the float to rise to the position shown in Plate 8074-A. The float is weighted to about three-fourths of its buoyancy. When the water has filled the body of the trap and overflowed into the float, its buoyancy is overcome, and the float sinks to the bottom of the trap, rapidly filling with water, carrying with it the lever, which widely opens the valve and the pressure of steam ejects the water. This arrangement allows a long travel of the float, and, consequently, long leverage upon the valve, so that a small float will operate a relatively large valve. The float is made of sheet copper and is seamed together.

Plate 8044-A. Tobey Steam Trap.

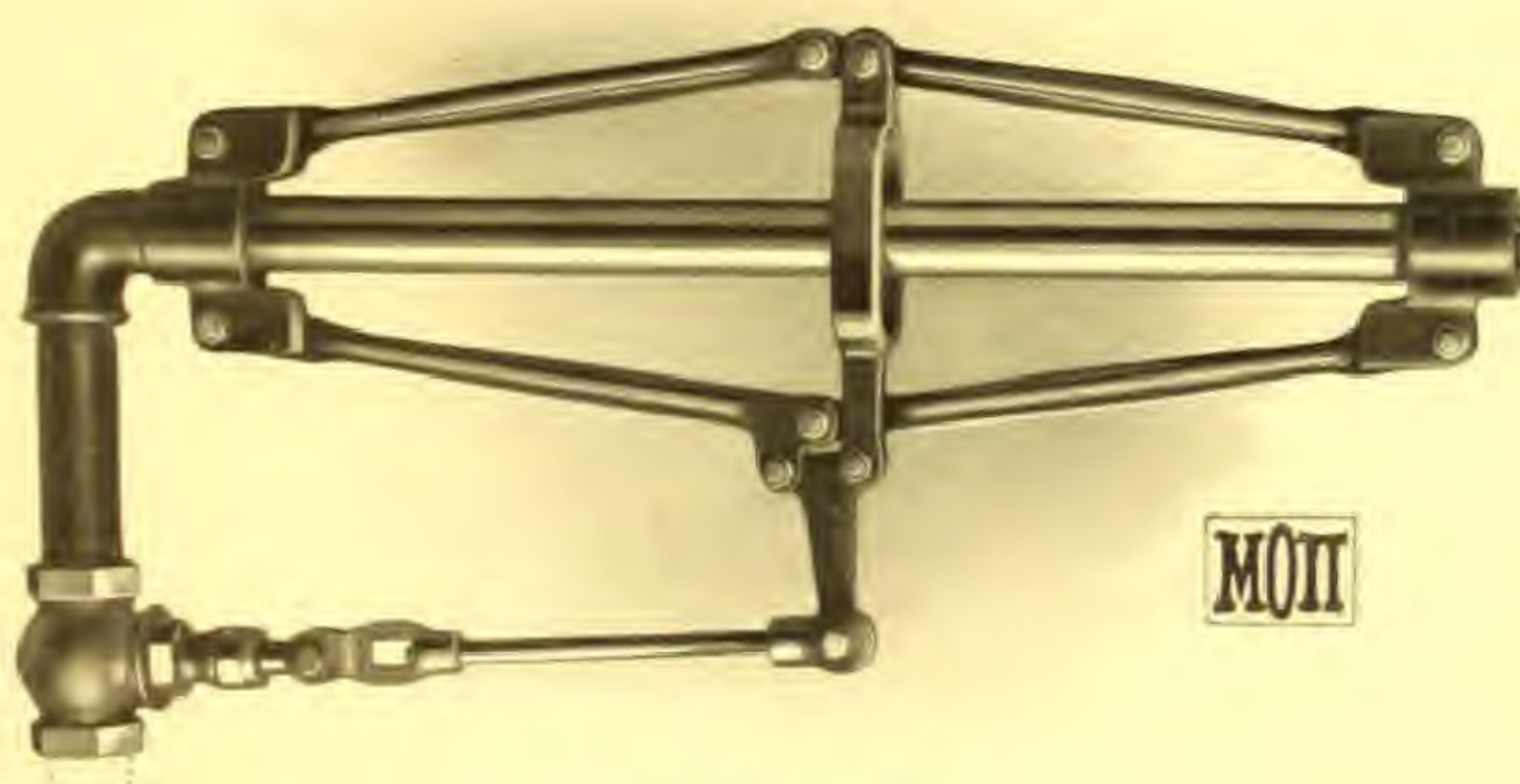


Plate 8073-A
Lawler Steam Trap

No.	SIZES			PRICES
	INLET	OUTLET	LENGTH	
0	$\frac{3}{8}$ inch	$\frac{3}{8}$ inch	18 inches	\$12 00
1	$\frac{1}{2}$ "	$\frac{1}{2}$ "	22 "	24 00
2	$\frac{3}{4}$ "	$\frac{3}{4}$ "	24 "	28 00
3	1 "	1 "	25 "	35 00
4	1½ "	1½ "	42 "	45 00
5	1½ "	1½ "	42 "	60 00
6	2 "	2 "	42 "	80 00

Plate 8073-A. The "Lawler" Steam Trap is of the simplest construction possible—no taking apart for cleaning is necessary as the valve can be held open by hand and the steam permitted to eject all scale or foreign matter. This trap cannot freeze as the valve is only closed when steam is in contact with the expansion tube which controls the valve.

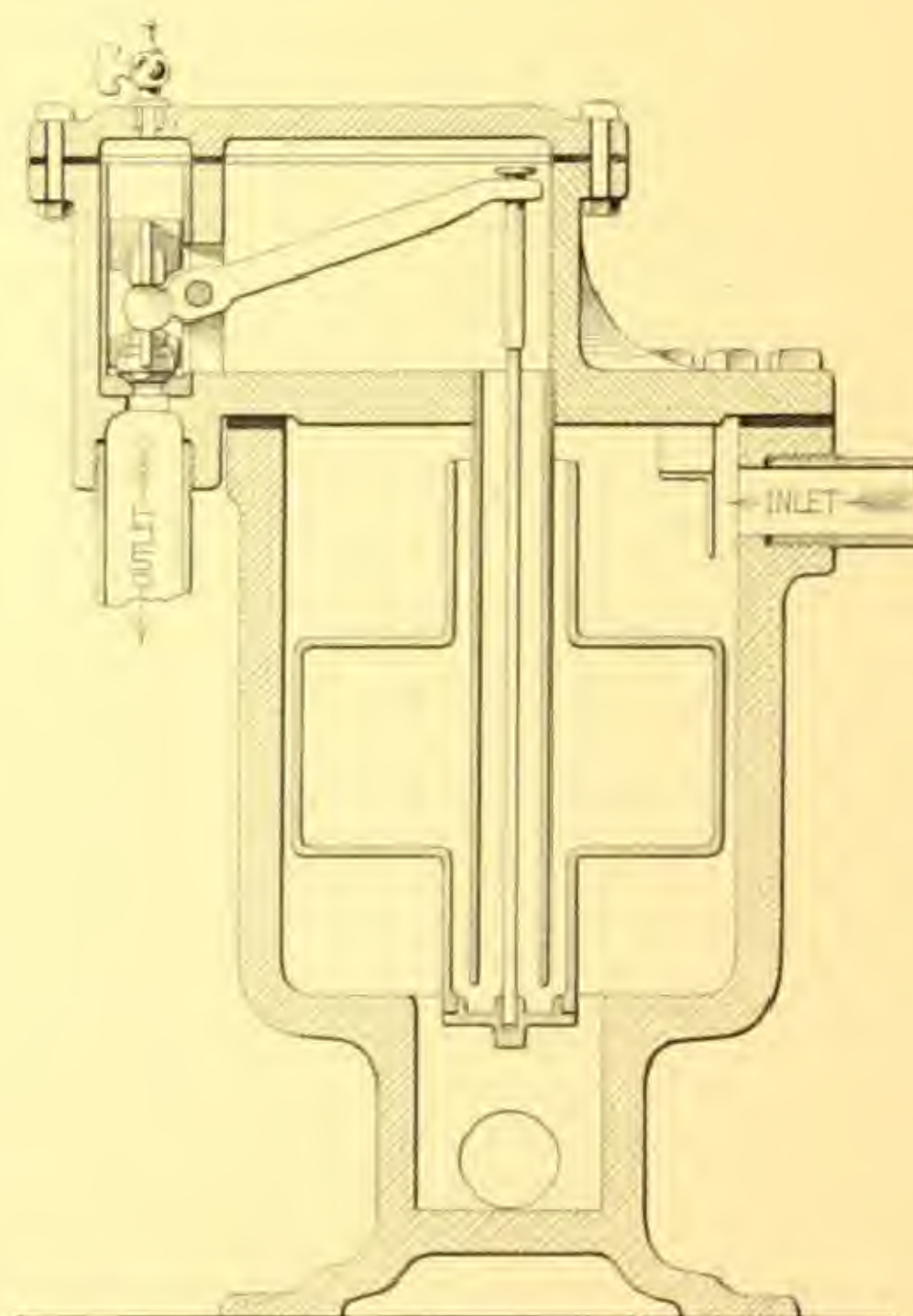


Plate 8074-A. Tobey Steam Traps.

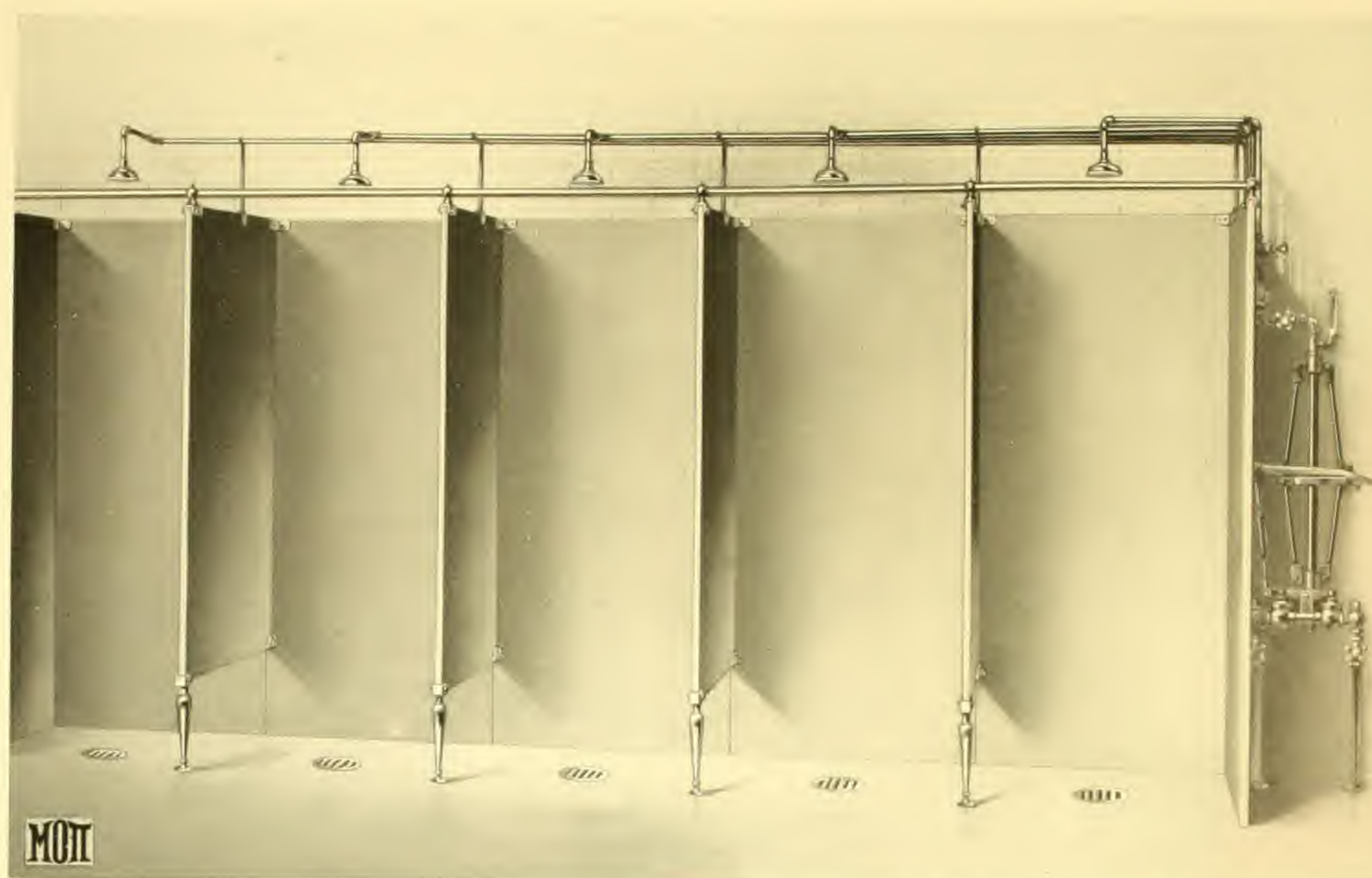

Plate 3128 $\frac{1}{2}$ -A

Plate 3128 $\frac{1}{2}$ -A. The "Barracks" range showers, comprising nickel-plated brass showers, rough brass $\frac{1}{2}$ " shower valves, Automatic Thermostatic Mixer with nickel-plated iron body thermometer, rough brass check valves, supply and control valves, slate stalls, nickel-plated brass rail with standards, nickel-plated brass legs, clamps and stirrups. (Piping from supply valves to floor not included in price; nothing is furnished from control valve above mixer except the loose individual shower valves and shower heads.) Price for three stalls as described	\$218 25
Four stalls as described	290 00
Additional stalls up to and including six add, each	43 00
Seven stalls as described	473 75
Additional stalls up to and including nine, add, each	43 00
Additional stalls above nine, price on application.	

If with Italian marble stalls, price on application. Nickel-plated 5" waste strainer and 3" coupling, each extra, \$3.75.

Dimensions: Total height, 7' 9"; diameter of shower head, 5"; stalls, 3' x 3'; height of back and partitions to floor, 6' 6"; height of legs, 12"; height of dividing partitions on legs, 5' 6"; thickness of slabs, $\frac{7}{8}$ ".

Sizes of Thermostatic Mixer and supplies to it are proportioned to the number of showers used.

It has long been the custom to regulate by hand the mixing of hot and cold water for showers—such adjustment may in a few moments become dangerous through sudden rise of temperature because of failure of the cold water supply or increase in temperature of the hot water supply. The "Lawler" Thermostatic Mixer prevents the possibility of such an occurrence, and delivers water to showers at any desired temperature. It will also prevent water being delivered above a given temperature. The above mixer should be protected by means of a wire screen or other enclosure to prevent same being tampered with.

For other details and prices of the Thermostatic Mixer, see opposite page.

“Lawler” Thermostatic Devices



Plate 3191-A

Plate 3191-A. The “Lawler” Automatic Thermostatic Mixer with $\frac{1}{4}$ ” inlet and outlet	\$75 00
Same, with 1” inlet and outlet	100 00
Same, with $1\frac{1}{4}$ ” inlet and outlet	150 00
Same, with 2” inlet and outlet	200 00

NOTE—In installing the above mixer it is necessary to provide check valves for the hot and cold supply. The above mixer is made of rough brass with jappaned cast-iron levers and polished brass expansion tube.

The “Lawler” Automatic Thermostatic Mixer is a device for automatically mixing hot and cold water so as to produce any desired temperature. While there are many uses to which this device can be profitably applied, its special use is that of automatically mixing hot and cold water to the desired temperature for shower and other baths, as the water is drawn and used direct from the pipes. By the use of this Automatic Thermostatic Mixer in gymnasiums, schools, asylums and other public institutions, there is no possibility of scalding, provided the mixer is set so as not to give a temperature above a predetermined point and the bather cannot change this; he can get lower temperature but not higher.

The “Lawler” Pneumatic Automatic Mixer shown in Plate 3192-A, is a device which has long been wanted in connection with the supply of hot water for bathing purposes. This mixer is admirably adapted for use with needle or shower baths. In addition to being a mixer this apparatus is also a temperature regulator, and can be adjusted to deliver water at any desired temperature.

By means of a key the Thermostat can be set so it will not deliver water above a given temperature desired and this maximum temperature will obtain until the key is again used to change the high temperature mark. For example, if a shower fitted with one of these Pneumatic Mixers is delivering water to the bather at 100 degrees and the cold water is suddenly shut off the hot water supply is instantly cut off, so there is no danger of scalding. It thus becomes a real anti-scalding device.

The “Lawler” Pneumatic Duplex is a combination of the Pneumatic Mixer, Plate 3192-A, and the “Thermo” improved anti-scalding valve, as shown in Plate 3087-A. The advantage of this apparatus over the Pneumatic Mixer alone is that the “Thermo” valve provides an easy graduation of the temperature of water from a point at which the mixer is set down to cold water alone. The above apparatus is suitable for a needle bath or a group of two or three showers.

Plate 3192-A. The “Lawler” Pneumatic Automatic Mixer with $8\frac{1}{2}$ ” tubular shower, $\frac{3}{4}$ ” mixing column with control valve, $\frac{1}{4}$ ” supply pipes to floor with escutcheons	\$114 25
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By means of the hot and cold supply valves any temperature may be obtained up to the limiting at which the apparatus is set by means of the key control.

Plate 3193-A. The “Lawler” Pneumatic Duplex with improved “Thermo” valve, $8\frac{1}{2}$ ” tubular shower, $\frac{3}{4}$ ” mixing column and supply pipes to floor with escutcheons and loose key regulating valves	\$160 50
Nickel-plated keys for regulating valves, each, extra	0 35



Plate 3192-A



Plate 3193-A

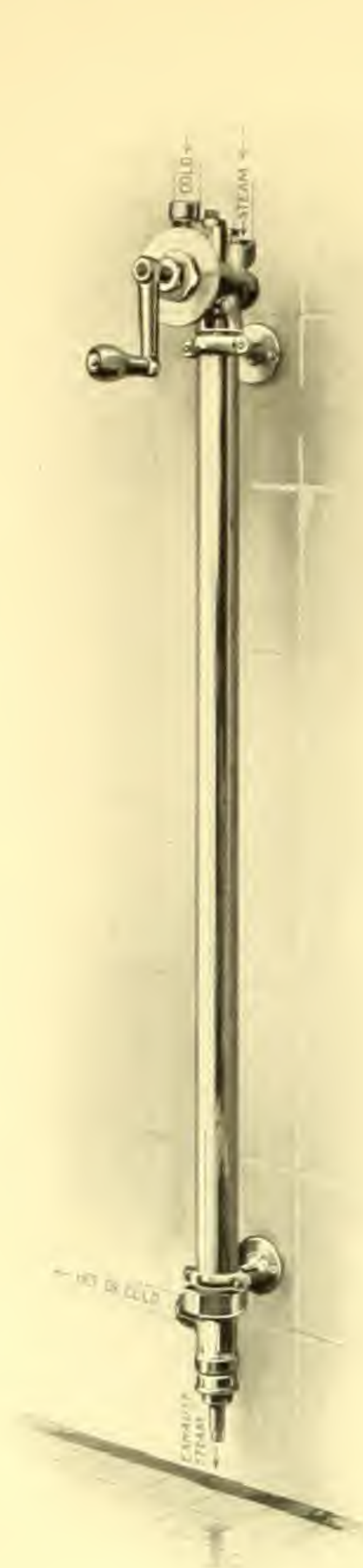


Plate 8015-A

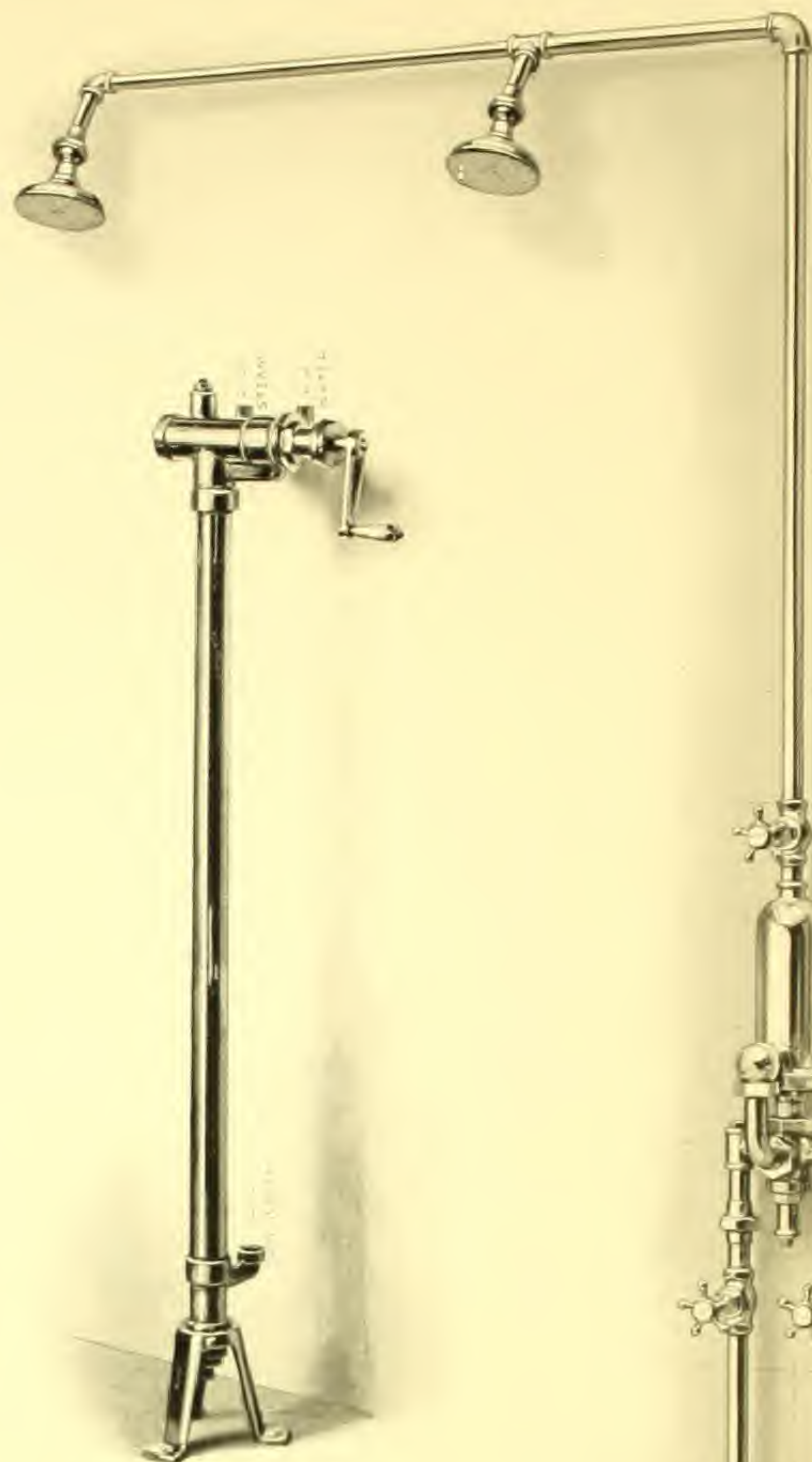


Plate 8014-A

Plate 8014-A. The "Security" Heater, 1 1/4-inch
Plate 8015-A. The "Security" Heater, 1 1/2-inch

Nickel-plated Brass	Rough Brass Bronzed	Rough Brass with outer shell of Galvanized Iron
\$55.00	\$47.00	\$40.00
47.50	40.00	35.25

The "Security" Heaters are intended to heat water for baths, lavatories, showers, culinary purposes, etc. In fact, wherever there is steam and no hot water system these heaters may be advantageously used.

When the valve of the "Security" Heater is opened slightly, cold water is admitted to bath, lavatories, etc. When opened further, tepid or hot water is instantly obtained depending on how far handle is turned. The one handle controls both hot and cold water.

These heaters are amply large for one bath tub, or one, two or three showers, depending on capacity of showers and steam and water pressure. Steam inlets are 1/2-inch; water inlets and outlets, 1/4-inch.

High and low pressure steam may be used.

Plate 3195-A. The "Lawler" Pneumatic Automatic Mixer with two 5" Rain Shower Heads, adjustable ball joint 1/4" mixing column with control valve, 1/4" supply pipes to floor, supply valves and escutcheons \$123.25
Add extra for three shower heads \$7.50 Add extra for four shower heads 13.75
If with "Lawler" Pneumatic Duplex Automatic Mixer plate 3193-A with two showers as described in plate 3195-A 167.75
Add extra for three shower heads \$7.50 Add extra for four shower heads 13.75

MOTT

Plate 3195-A

MOTT'S HEATERS FOR WATER SUPPLY



Plate 8017-A

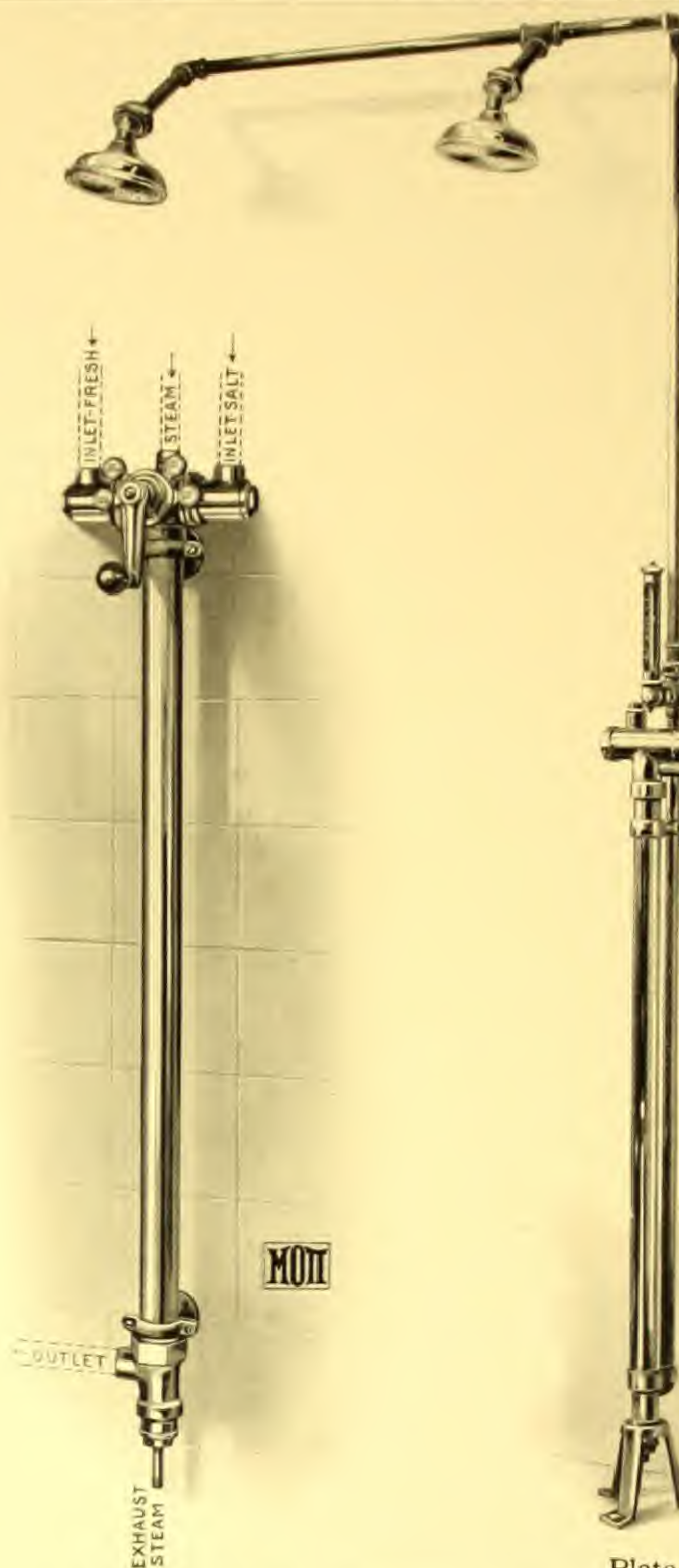


Plate 8016 1/2-A



Plate 8013-A

Plate 8016 1/2-A. The "Security" Heater (patented), 1 1/4"

Plate 8016 1/2-A will heat two kinds of water but they cannot be mixed. In swinging handle to the left, one kind of water is obtained first cold, then hot. In swinging to the right the other kind of water is obtained first cold then hot.

These heaters are amply large for one bath tub, or one two or three showers, depending on capacity of showers and steam and water pressure. Steam inlets are 1/4-inch; water inlets and outlets, 3/4-inch.

Plate 8013-A. The "Security" 1 1/4" nickel-plated brass heater with thermometer and adjustable showers

Same, brass, bronzed

Same, with outside tube and pipe to shower of galvanized iron, remainder of brass bronzed

The showers may be set up with or without stalls. The above prices are based on showers being placed 3' center to center. The following table shows the prices and approximate capacity of the "Security" heaters:—Plate 8017-A.

	Steam Inlet	Water Inlet and Outlet	Steam Pressure Pounds	Cold Water Temperature Degrees	Hot Water Temperature Degrees	Gallons Heated per Minute	Nickel-plated Brass	Rough Brass Bronzed	Rough Brass with outer shell of Galvanized Iron
Plate 8017-A, 2 1/2" diameter	1"	1 1/4"	25	50	110	16	\$147 00	\$114 00	\$103 00
Same, 3" diameter	1"	1 1/2" or 2"	25	50	102	22	183 00	143 00	127 00

Depending on steam and water pressure and shower capacity, the 2 1/2" heater will supply 4 to 12 showers; and the 3", 6 to 16 showers. When steam pressure is high or water pressure low, Plates 8014-A or 8015-A will be found amply large for a bath tub. With high water pressure or low steam pressure, we would advise using Plate 8017-A.

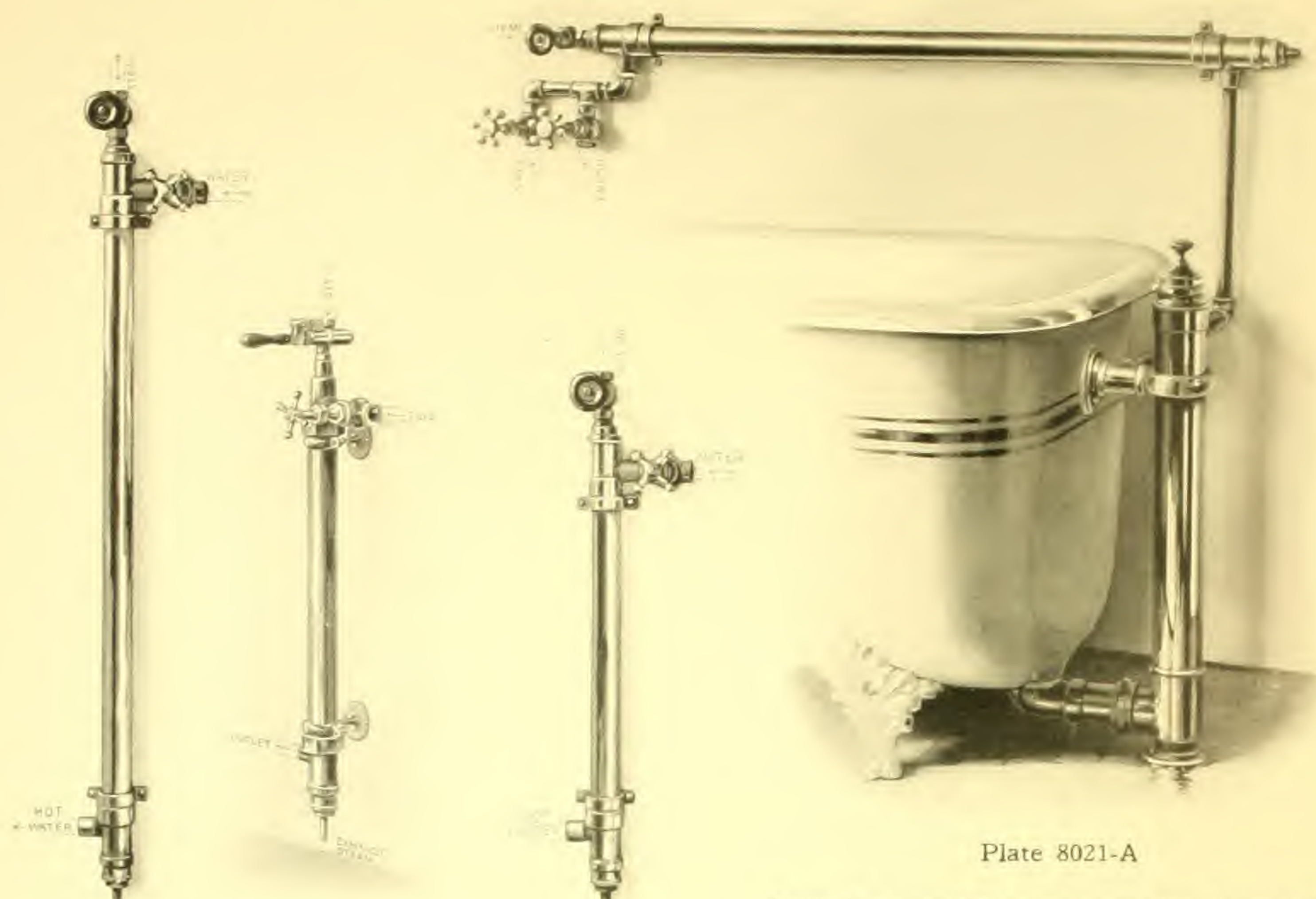


Plate 8025-A

Plate 8028-A

Plate 8027-A

Plate 8021-A

An application of "Economic" Heater—Plate 8025-A

	Outside Diameter	Size Steam Connection Feed-Return	Water Connections	Nickel-plated Brass	Rough Brass Bronzed	Rough Brass outer shell of Galvanized Iron
Plate 8025-A. The "Economic" Heater, 1 1/4"		1/2"	3/4"	\$33.00	\$26.75	\$24.00
Plate 8028-A. The "Economic" Heater, 1 1/4"		1/2"	3/4"	\$22.00	\$18.00	\$16.00
Plate 8027-A. The "Economic" Heater, 1 1/4"		1/2"	3/4"	\$20.00	\$16.00	\$14.00

Plate 8028-A has a self-closing steam valve which not only saves steam, but also guards against leaving steam valve open when not in use, which might heat the water in the heater to a high temperature.

The "Economic" Steam Water Heaters are adaptable for heating water in small quantities instantaneously, wherever steam can be had. Such instances are common in hotels, bath establishments, on ship board, in Pullman cars, etc., where little space is available and hot water is wanted instantly.

As no storage capacity is required when using this apparatus, it is very appropriate for use in seaside hotels, mineral springs, resorts, etc., where two or more kinds of water are wanted for bathing purposes.

These heaters are made in sizes for use with a single bath or shower or groups of them.

The heater consists of an outer shell of brass or iron containing a nest of small tubes or a single tube. These tubes carry the steam while the water circulates on the outside. The heating is instantaneous. The advantage of a system of this kind is that the steam is not wasted and no more water is heated than is required.

The heater may be placed in any desired place, under the lavatory, back of the bath, in the corner of the room or elsewhere.

“Thermo” Improved Anti-scalding Valve

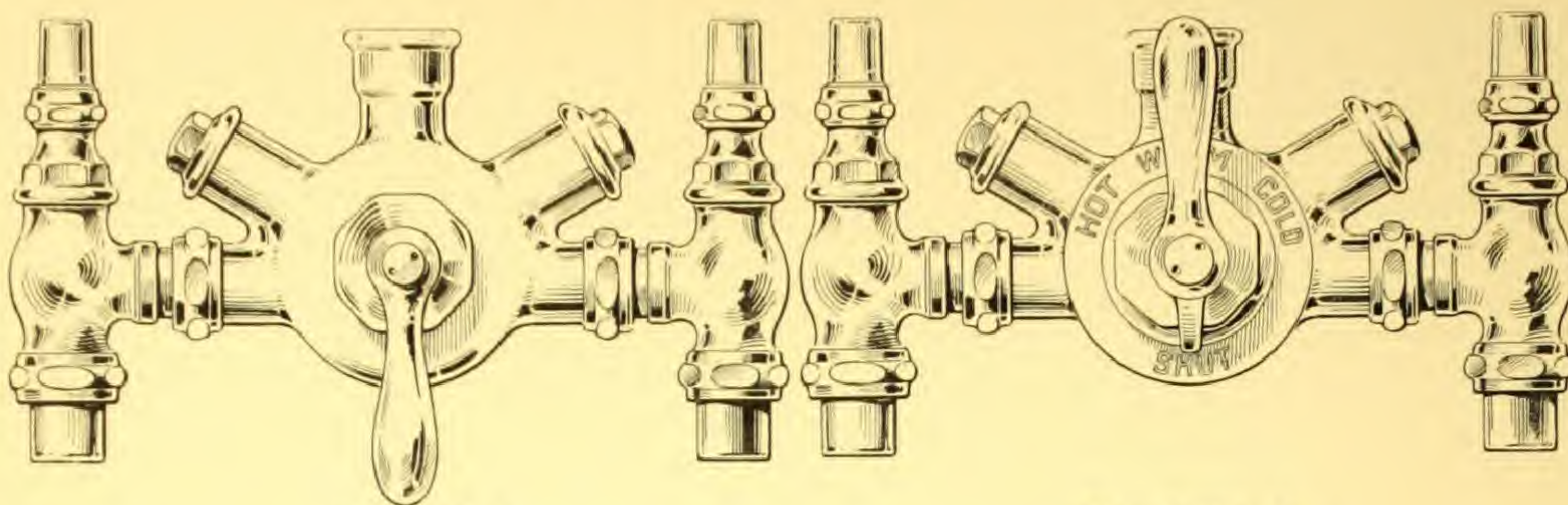


Plate 3087-A

Plate 3088 1/2-A

Plate 3087-A. Illustrates the “Thermo” nickel-plated improved anti-scalding valve with nickel-plated handle and loose key regulating valves on hot and cold supply.

Plate 3088 1/2-A. Illustrates the “Thermo” nickel-plated improved anti-scalding valve with nickel-plated handle, index ring and pointer, and loose key regulating valves on hot and cold supply.

NOTE.—The “Thermo” improved anti-scalding valve is furnished for 3/4" mixing column and 1/2" supplies, also for 1/2" mixing column and 3/8" supplies.

Special attention is directed to the following improvements in the “Thermo” anti-scalding valve which makes it the best of its kind on the market:

First. The ball bearing action between the valve spindle and cam gives an easy movement to the valve.

Second. The valve has an adjustable stop accessible from the outside of casing, by which the hot water may be increased or diminished. In other words, if the valve is delivering hot water at 120 degrees this stop can be set so as to cut it down to 100 or 105 degrees or to practically whatever degree is desired provided the conditions do not change.

Third. A frictional member has been introduced between the valve spindle and casing which is sure and simple in operation and does not produce any binding no matter how hot the parts become.

Fourth. The angle graduated control valves for hot and cold supply are so constructed that they give a very fine adjustment as to the amount of hot or cold water that will pass through them. By this means the supply entering at a great difference of temperature and pressure can be regulated to suit any reasonable conditions.

The “Thermo” improved anti-scalding valve with graduated regulating valves has been thoroughly tested under all conditions, such as extreme variations in the temperature of the water supply and difference in pressure of the hot or cold water. These tests have demonstrated that the “Thermo” improved valve can be depended upon to operate satisfactorily.

With the regulating valves on hot and cold supply it is a very simple matter for the engineer or attendant to adjust the valve to suit any local conditions.

The improved “Thermo” valve has been installed in many Y. M. C. A. buildings throughout the country and we have yet to hear of a single instance where this valve has not given entire satisfaction.

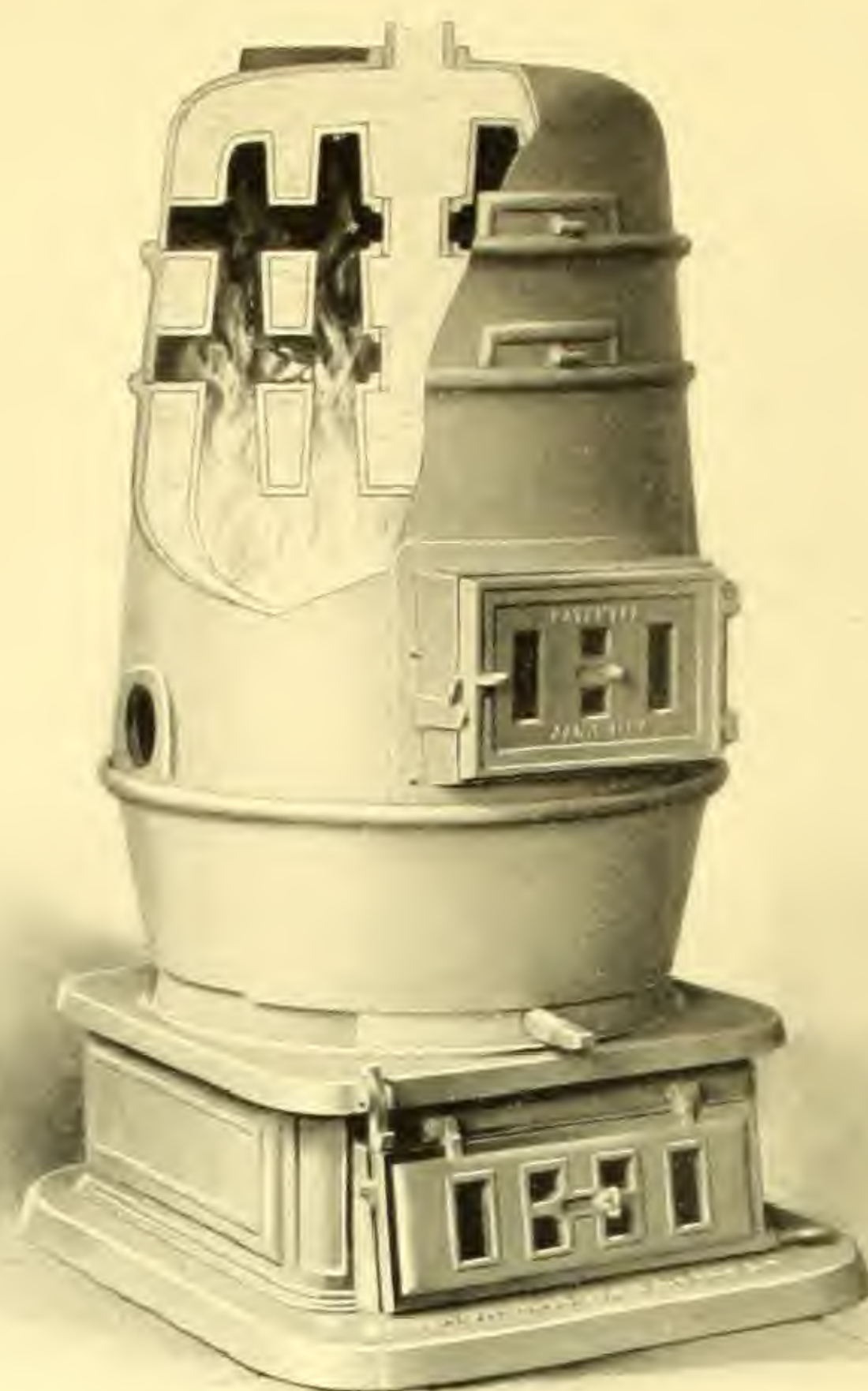


Plate 8031-A

Above cut is of No. 28 Heater.
Other numbers vary slightly.

The Sunray Tank Heater

DIMENSIONS AND PRICES

No.	Diameter of Fire Pot	Size of Base in inches	Diameter of Smoke Pipe	Height of Heater	Size of Tapping	Distance from Floor to Center Bottom Tapping	Tank Capacity in Gallons	Direct Radiation Square feet	Price	Approximate Weight
22	14"	21 x 25	6"	39"	2"	22"	200	150	\$52.00	365 lbs.
22½	14"	21 x 25	6"	39"	2"	22"	225	175	56.00	390 "
23	14"	21 x 25	7"	40"	2"	22"	275	200	60.00	400 "
23½	14"	21 x 25	7"	40"	2"	22"	300	225	65.00	475 "
24	17"	25 x 30	7"	42"	2½"	23"	350	275	70.00	542 "
24½	17"	25 x 30	7"	42"	2½"	23"	425	325	85.00	565 "
25	17"	25 x 30	8"	43"	2½"	23"	500	400	100.00	610 "
25½	17"	25 x 30	8"	47"	2½"	23"	550	475	115.00	717 "
26	21"	28 x 34	8"	48"	3"	25"	575	500	125.00	725 "
27	21"	28 x 34	8"	48"	3"	25"	625	550	130.00	825 "
28	21"	28 x 34	8"	50"	3"	22½"	700	600	145.00	952 "
28½	21"	28 x 34	8"	55"	3"	22½"	750	650	160.00	1085 "
30	24"	32 x 36	9"	51"	4"	25½"	850	750	195.00	1247 "
31	24"	32 x 36	9"	56½"	4"	25½"	950	850	215.00	1417 "
32	24"	32 x 36	9"	63"	4"	25½"	1050	950	245.00	1562 "

All sizes up to and including No. 28½ have a tapping on each side for return. Numbers 30, 31 and 32 have only one return tapping 4" in back. Distance from floor to center of return tapping includes legs, excepting No. 28, 28½, 30, 31, 32, which are furnished without legs. The tank capacities represent the size of tanks which experience has shown the heaters will supply for ordinary family use. For special requirements proper capacities should be provided.

The "Sunray" Tank Heater is designed to utilize the heat generated by the burning fuel to the fullest extent before the smoke is allowed to pass up the chimney.

In the upper part of the fire-pot are water tubes, which deflect and spread the products of combustion over the surfaces of the upper section before they pass into the chimney, thus bringing the fire in contact with every part of the heating surface.

This heater is strong, durable, and is tested to 100 lbs. pressure. It can be quickly set up, and has few parts that are likely to get out of order. All water joints are made and the base completely assembled before shipment, so that the fitter has only two parts to handle.

These heaters are not intended to be used under a pressure over 45 lbs. though many are successfully installed under much higher pressure and we frequently test heaters to meet such situations, but aside from such tests, we do not assume any responsibility. We recommend the use of Safety Valves set at 10 lbs. above the working pressure on all installations.



Plate 8005-A. Sunray Heater.

No.	Size of Top	Size of Fire Pot	Size of Tapping	Depth of Water Cylinder	Floor to Center of Return	Price
52	27" X 27"	12 in.	1 1/4 in.	12 in.	14 in.	\$55.00

This "Sunray" Tank and Iron Heater will heat from 50 to 125 gallons. Top has heating surface for from 18 to 24 irons, but when irons are being used the capacity for heating water is considerably reduced.



Plate 8075-A. Sunray Heater.

No.	Size of Fire Pot	Size of Smoke Pipe	Storage Tank Capacity in Gallons	Size of Tappings	Height of Heater	Distance from floor to Center of Return Tapping	Price of Heater only
20	10"	6"	75	1 1/4"	27"	16"	\$32.00
20A	10 1/2"	6"	100	1 3/4"	28"	17"	35.00
21	10"	7"	125	1 1/4"	30"	16"	37.00
21A	10 1/2"	7"	150	1 3/4"	31"	17"	40.00



Plate 8076-A. Application of 8005-A in Laundry.

An adequate supply of hot water in residences is now a necessity. Plate 8076-A illustrates a simple installation, but it can be enlarged to suit any requirement. It is not wise to use a laundry iron heater in combination with a water heater where the tank exceeds one hundred gallons capacity. If the needs go above this capacity it is better to use a "Sunray" Tank Heater and a separate "Mott" Iron Heater.

Sunray Tank Heating System

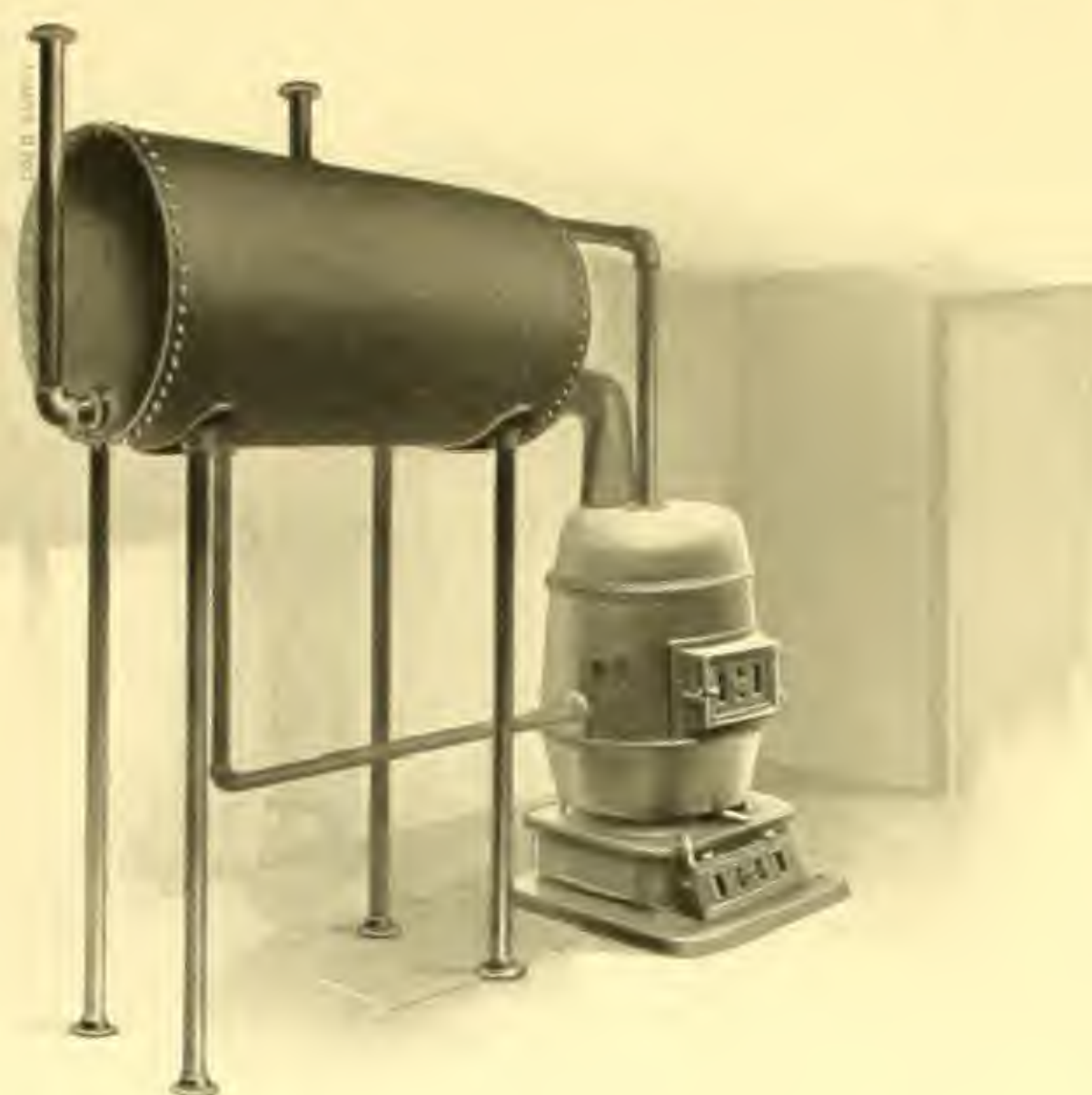


Plate 8077-A.



Plate 8080-A

"Lawler" Pneumatic Damper Regulator, \$15.00.

It is desirable to check the fire in a tank heater or other water heater and to do this automatically.

Plate 8080-A, "Lawler" Pneumatic Damper Regulator can be set for desired temperature of water. When this point is reached it automatically acts on the dampers to check fire and is thus a valuable and economic factor.

Plate 8077-A represents "Sunray" Tank Heater and Tank, the best apparatus for furnishing hot water for apartment houses, small hotels, laundries, etc., where it is desired to heat the water directly by fire. These heaters and tanks are made in sizes to suit any requirement. The tank may be placed in a vertical position if conditions make it desirable. The size of storage tank to be used with such a plant should be proportioned to the number and kind of fixtures that are to be supplied with hot water.

Tank Heater and Heating System Combined

Plate 8081-A shows the interior of a private stable in which the heater supplies the hot water, as well as furnishing heat for the office and men's quarters.

An apparatus may be arranged in a similar way for a small or large stable, and radiators may be arranged to hang on the walls as well as to set on the floors.

Hot water circulating pipes are taken to the tank the same as the connections to a radiator, and as the apparatus is supplied with a self-feeding tank for the water supply as soon as hot water is drawn off it is at once replaced. The water works pressure may be directly used.

The tank may be vertical the same as an ordinary range boiler, or horizontal on a stand in place of hangers, as shown in the illustration.

Plate 8081-A



Hot Water Required for Different Fixtures

For each shower or bath tub, one hundred gallons per hour are necessary when such fixtures are used three times per hour; if used more frequently, an additional quantity will be necessary.

For lavatories and similar fixtures in hotels and office buildings, five gallons per hour will be sufficient, but in factories ten to fifteen gallons per hour are necessary. For hotels and kitchens of institutions, ten gallons of hot water per hour should be provided for each guest or person it is proposed to accommodate. For laundries, it is necessary to supply hot water according to their capacities for turning out work. A laundry turning out 1,000 pieces per day should have a supply of hot water equal to 1,000 gallons per hour, and so on for larger quantities.

It is not here intended to assert that the quantities of hot water mentioned as being necessary for different purposes will be actually used at all times; but provision for supplying such quantities is actually necessary, though there may be only one or two hours at a time when the apparatus will be called on to supply the maximum amount provided for.

Storage Tanks

Where a steam power plant is provided, and an ample supply of steam at 50 or 60 lbs. pressure can be depended on, it is not necessary to provide any storage of hot water, as the heat can be stored up in the steam with greater economy and used to heat the water only as it is needed. In cases, however, where the steam plant is too small to supply the maximum of hot water needed for special periods, it is necessary to have a storage tank in which hot water may be stored to provide for rush hours that the steam boiler capacity could not supply. The size of tank needed can be determined only by knowing the exact conditions and requirements in each case.

In cases where there is no high pressure plant provided, or where it is desired to have a plant that can be operated without expert help, the hot water can be provided by the use of "Sunray" Water Heaters. In all such plants, however, storage tanks are a necessity.

Storage Tanks for Apartment Houses

For apartment houses the storage tank should have a capacity equal to twenty-five gallons for each family in houses of ten families, twenty gallons per family in houses of twenty families, and fifteen gallons per family for larger houses. The heater should be large enough to heat such tank in two or three hours. It is not wise to put in too large a heater, as the water is apt to become over heated when little or no water is being used.

If shower baths are used a large quantity per family should be provided.

Hot Water Supply for Family Use

For family use twenty gallons tank capacity should be provided by each bath room, and twenty gallons for the kitchen and laundry. The water heater should have a capacity equal to or greater than the total number of gallons in tank.



Plate 8079-A

Galvanized Range Boilers

Capacity Gallons	Diameter	Standard Tested 200 lbs.	Extra Heavy Tested to 250 lbs.	Capacity Gallons	Diameter	Standard Tested to 200 lbs.	Extra Heavy Tested 250 lbs.
18	3' × 12"	\$14 50	Prices on Application	48	6' × 14"	\$30 00	Prices on Application
21	3½' × 12"	15 50		52	5' × 16"	31 00	
24	4' × 12"	15 75		53	4' × 18"	31 50	
24	3' × 14"	19 00		63	6' × 16"	38 00	
27	4½' × 12"	18 50		66	5' × 18"	38 00	
28	3½' × 14"	20 25		79	6' × 18"	44 00	
30	5' × 12"	19 00		82	5' × 20"	45 50	
32	4' × 14"	21 00		98	6' × 20"	61 50	
35	5' × 13"	21 00		100	5' × 22"	63 50	
36	6' × 12"	24 50		120	5' × 24"	72 50	
36	4½' × 14"	21 50		144	6' × 24"	103 00	
40	5' × 14"	24 00		168	7' × 24"	120 00	
42	4' × 16"	26 00		192	8' × 24"	132 00	
47	4½' × 16"	30 00					

All above are tapped 1 inch—Two Tappings in top—one on side—one in bottom—Special sizes and locations of Tappings must be specified on order

Wrought Steel Tanks—Plate 8079-A

Dimensions	Capacity	Black Standard ¼" Head ⅝" Shell Tested to 100 lbs.	Galvanized Standard ½" Head ⅝" Shell Tested to 100 lbs.	Black or Galvanized Extra Heavy ¾" Head ⅝" Shell Tested to 200 lbs.
5' × 24"	120 gallons	\$60 00	\$80 00	Prices on Application
6' × 24"	145 "	62 00	88 00	
7' × 24"	170 "	64 00	96 00	
8' × 24"	200 "	66 00	104 00	
5' × 30"	185 "	70 00	98 00	
6' × 30"	220 "	76 00	110 00	
7' × 30"	257 "	84 00	122 00	
8' × 30"	300 "	92 00	140 00	
10' × 30"	375 "	104 00	154 00	
6' × 36"	325 "	92 00	140 00	
7' × 36"	375 "	104 00	154 00	
8' × 36"	425 "	120 00	170 00	
10' × 36"	530 "	134 00	200 00	
8' × 42"	600 "	150 00	220 00	
10' × 42"	725 "	170 00	245 00	
12' × 42"	850 "	190 00	280 00	

All tanks up to and including 5' x 3' are tapped 1½"; all larger sizes are tapped 2" unless otherwise ordered.

Cut shows how tanks are regularly furnished with four tappings and one hand hole in the concave head.

If special location or size of tappings is required order must so specify.

Man-Holes - - - \$12.00 extra

Set of three legs, as per cut. \$5.00 extra

